

Q11  
B695  
NH

# JOURNAL OF THE

# BOMBAY NATURAL HISTORY SOCIETY

DECEMBER 2015

VOL. 112 (3)



**BNHS**  
India  
CONSERVING  
NATURE SINCE 1883

# JOURNAL OF THE BOMBAY NATURAL HISTORY SOCIETY

Hornbill House, Shaheed Bhagat Singh Marg, Mumbai 400 001.

## EXECUTIVE EDITOR

**Deepak A. Apte**, Ph. D.  
Bombay Natural History Society, Mumbai

## COPY EDITOR

**Ranjit Manakadan**, Ph. D.  
Bombay Natural History Society

## COPY AND PRODUCTION EDITOR

**Vibhuti Dedhia**, M. Sc.  
Bombay Natural History Society

---

## Editorial Board

**Ajith Kumar**, Ph. D.  
National Centre for Biological Sciences,  
GKVK Campus, Hebbal, Bengaluru,  
Karnataka

**C.R. Babu**, Ph. D.  
Professor, Centre for Environmental Management  
of Degraded Ecosystems,  
University of Delhi,  
New Delhi

**Anwaruddin Choudhury**, Ph. D., D. Sc.  
The Rhino Foundation for Nature,  
Guwahati, Assam

**Indraneil Das**, D. Phil.  
Institute of Biodiversity and Environmental Conservation,  
Universiti Malaysia, Sarawak,  
Malaysia

**Y.V. Jhala**, Ph. D.  
Wildlife Institute of India,  
Dehradun, Uttarakhand

**K. Ullas Karanth**, Ph. D.  
Wildlife Conservation Society – India Program,  
Bengaluru, Karnataka

**Aasheesh Pittie**, B. Com.  
Bird Watchers Society of Andhra Pradesh,  
Hyderabad, Andhra Pradesh

**G.S. Rawat**, Ph. D.  
Wildlife Institute of India,  
Dehradun, Uttarakhand

**J.D. Marcus Knight**, Ph. D.  
Chennai, Tamil Nadu

**J.S. Singh**, Ph. D.  
Professor, Banaras Hindu University  
Varanasi, Uttar Pradesh

**S. Subramanya**, Ph. D.  
University of Agricultural Sciences, GKVK,  
Hebbal, Bengaluru, Karnataka

**R. Sukumar**, Ph. D.  
Professor, Centre for Ecological Sciences,  
Indian Institute of Science, Bengaluru, Karnataka

**Romulus Whitaker**, B. Sc.  
Madras Reptile Park and Crocodile Bank Trust,  
Tamil Nadu

**S.R. Yadav**, Ph. D.  
Shivaji University, Kolhapur,  
Maharashtra

---

## Consultant Editors

**Raghubandan Chundawat**, Ph. D.  
Wildlife Conservation Society, Bengaluru

**Nigel Collar**, Ph. D.  
BirdLife International, UK

**Rhys Green**, Ph. D.  
Royal Society for Protection of Birds, UK

**Qamar Qureshi**, M. Phil.  
Wildlife Institute of India, Dehradun

**Asad R. Rahmani**, Ph. D.  
Bombay Natural History Society

**Gayatri W. Ugra**, Ph. D.  
Bombay Natural History Society

Editorial Assistant: **Sonali V. Vadhavkar**, M. Sc.  
Layout and Typesetting: **V. Gopi Naidu and Sanchita S. Kadge**

# CONTENTS

VOLUME 112(3): DECEMBER 2015

PUBLISHED: MAY 2017

EDITORIAL.....	125
NEW RECORDS OF OPISTHOBRANCH FAUNA (MOLLUSCA: HETEROBRANCHIA) FROM ANDAMAN & NICOBAR ISLANDS, INDIA Deepak Apte, Sumer Verma and Digant Desai .....	127
RARE AND INTERESTING BUTTERFLY (LEPIDOPTERA) RECORDS FROM ARUNACHAL PRADESH, INDIA Arun P. Singh .....	138

## MISCELLANEOUS NOTES

### MAMMALS

1. Indian Roundleaf Bat *Hipposideros lankadiva*: first record for Bangladesh  
Anik Saha, Mohammed Mostafa Feeroz and Md Kamrul Hasan..... 165

### AVES

2. Note on the Jungle Bush-Quail *Perdica asiatica* in Kerala, southwest India: museum records  
V.J. Zacharias and Kristof Zyskowski..... 166
3. First sighting of Laughing Dove *Streptopelia senegalensis* in Kargil district of Ladakh, Indian trans-Himalaya  
Tanveer Ahmed, Afifullah Khan and Pankaj Chandan... 168
4. Ceylon Frogmouth *Batrachostomus moniliger* Blyth in the High Wavy mountains, Tamil Nadu, southern India  
V.J. Zacharias and B.M. Beehler..... 169
5. White-capped River-Chat *Phoenicurus leucocephalus* in Odisha: first record from peninsular India  
Asif N. Khan and Rahul Khot..... 170
6. Range extension of Golden-crested Myna *Ampeliceps coronatus* and its first record in Tripura, India  
Harshakumar Chikkanaragund and A.K. Gupta ..... 171
7. First record of Black-legged Kittiwake *Rissa tridactyla* in Odisha, India  
Monalisa Bhujabal, Nanda Kishore Bhujabal and Chinmaya Bhujabal ..... 172
8. The Monsoon Feast: Congregation of birds feeding on a termite swarm at Walayar, Kerala, India  
Selvaraj Ramesh Kumar ..... 173
9. Blue Rock Pigeon *Columba livia* (Family Columbidae) preying on winged termites (Insecta: Isoptera)  
Ashish Shukla..... 175

### REPTILES

10. Report of Rock Agama *Psammophilus* sp. preying on Fan-throated Lizard *Sitana* sp. in Gomardah Wildlife Sanctuary, Raigarh district, Chhattisgarh, India  
A.M.K. Bharos, Akhilesh Bharos, N.D. Agrawal and Shishir Das ..... 176

### FISH

11. Rabbit Fish *Siganus canaliculatus*: a new host record for isopod parasite *Nerocila arres* Bowman and Tareen, 1983  
Malay Kanti Dev Roy, Shibananda Rath, Santanu Mitra and Subhrendu Sekhar Mishra ..... 177

### INSECTS

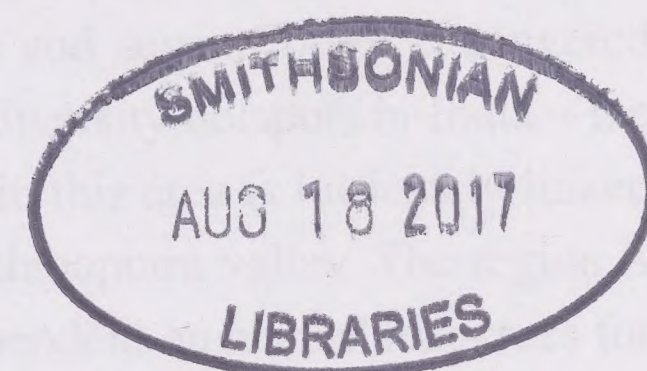
12. *Buchanania cochinchinensis* (Lour.) M.R. Almeida: a new host plant for *Scutellera perplexa* (Westwood) (Hemiptera: Scutelleridae)  
Akshay A. Onkar and Ashish N. Nerlekar ..... 179
13. Tiger butterflies attracted to light near Sir Syed College campus, Taliparamba, Kannur, northern Kerala, India  
Vinayan Nair ..... 180
14. Additions to larval host plants of Indian butterflies (Lepidoptera)  
Deepak Naik and Mohammed S. Mustak..... 181

### OTHER INVERTEBRATES

15. Three new records of Opisthobranchs (Mollusca) from Lakshadweep Islands, India  
Deepak Apte, Idrees Babu and V.K. Salahuddin ..... 183
16. First record of *Titiscania limacina* Bergh, 1890 (Mollusca: Gastropoda) from India  
Deepak Apte and Sayali Nerurkar ..... 185

### BOTANY

17. *Portulaca granulato-stellulata* (Poelln.) Ricceri & Arrigoni: a new record for flora of Gujarat, India  
Rupesh Maurya, Umerfaruq M. Qureshimatva, Jaivin Patel and Hitesh Solanki ..... 188
18. Additions to the flowering plants of Goa, India  
Sharad S. Kambale, Anup S. Deshpande and Ravikiran S. Pagare ..... 189
19. Viral diseases of four tree species in forest nurseries of Indore, India  
Hemant Pathak and S.C. Silawat ..... 191



## ACKNOWLEDGEMENT

WE ARE GRATEFUL TO THE MINISTRY OF SCIENCE AND TECHNOLOGY,  
GOVT. OF INDIA,  
FOR FINANCIAL SUPPORT FOR THE PUBLICATION OF THE *JOURNAL*.



## The threat of dams to Northeast India

Northeast India, comprising the seven sister states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland and Tripura, and the Himalayan state of Sikkim, is known for its biodiversity, culture, and the unique Brahmaputra river system.

The region is rich in biodiversity and home to wildlife species such as the Rhino, Elephant, Tiger, Asiatic Buffalo, Hoolock Gibbon, Pygmy Hog, Gangetic River Dolphin and several other endangered species of birds, amphibians, reptiles, and plants. Two of three global biodiversity hotspots in India – the Himalaya and Indo-Myanmar – traverse the Northeast. The river system in this area is intricately linked with the floodplain ecology of wetlands (*beels*) and grasslands of the Brahmaputra valley. The region is home to more than a hundred tribal communities, and they are heavily dependent on natural resources for their livelihood (Vagholikar and Das 2010).

The physical link between the Northeast and the rest of the Indian mainland is a slender 21 km stretch through north Bengal. Besides its geographical isolation, the requirement of an Inner Line Permit to enter some areas of the region has kept some parts of it protected from the environmental disturbances that afflict the other parts, such as conversion of massive stretches of land into privately owned tea gardens in Assam. At the same time, this isolation has also led to the economic and political marginalization of Northeast India (Menon and Kohli 2005).

To address these issues, a plan was laid out for the development of Northeast India which incorporated large hydel projects as vital components of the development plan. A July 2002 press release of the Ministry of Development of the North Eastern Region (DONER), presented the region's "potential to be India's future powerhouse". In October 2011, Central Electricity Authority (CEA)'s Preliminary Ranking Study of the potential of hydroelectric schemes for all river basins in the country ranked the Brahmaputra river system to be the best. A total of 149 hydel project schemes were proposed, to be implemented by National Hydro Power Corporation (NHPC), North Eastern Electric Power Corporation (NEEPCO), the Brahmaputra Board, and State Electricity Boards, among others. Over the last decade, Arunachal Pradesh signed more than 150 memorandums of understanding with various agencies for hydel power projects, which if effective, would make Arunachal home to one of the greatest concentrations of dams in the world (Rajshekhar 2016).

Hydroelectric projects in the Northeast are being promoted by portraying dams as the solution for all the problems of the region. Are these claims valid? Human displacement due to submergence may be relatively small as compared to other parts of India. However, since the terrain of states like Arunachal Pradesh is hilly, there is already little land where permanent cultivation is possible, and this arable land will be submerged by some of the proposed projects, thus affecting the livelihood of locals (Menon *et al.* 2003).

Large hydroelectric projects coming up in our country need to pass through the mandatory environmental clearances from the MoEFCC to evaluate their viability on environmental and social grounds. Based on their specific locations, hydroelectric projects could also require other clearances such as 'forest clearance' from the MoEFCC and approval from the Standing Committee of the National Board for Wildlife (NBWL), if located inside wildlife Protected Areas (PAs). EIA reports are a key feature of the environmental clearance process. A cursory look at many of the EIA reports, particularly on the ecology and biodiversity aspects, speaks volumes about their standards. Granting of clearances based on frivolous and below par studies unfortunately decides the fate of some of our country's most important wildlife habitats. EIA reports of at least five large hydroelectric projects – Kameng, Lower Subansiri, Middle Siang, Tipaimukh, and Dibang – were found to be shoddy in their reporting on wildlife by Dr. Anwaruddin Choudhury, a well-known naturalist of the region (Vagholikar 2008).

For example, Zemithang valley, identified as an Important Bird Area, is the site where the Nyamjang Chu Dam will be constructed. In India, the Black-necked Crane winters in only two places: Sangti valley and Zemithang. The Zemithang wintering site of the Black-necked Crane will be fully impacted by the dam; in fact, the barrage/dam is located at the very site where the Black-necked Crane winters! This area is already extremely small, just 3 sq. km. The barrage/dam will change the flow patterns, significantly submerge the area, and create a new structure in the wintering site of Black-necked Crane. Other than these, the tunnel is also likely to impact ecology significantly, changing the riparian habitat that the cranes require. The EIA report of the project does not even mention the existence of the Black-necked Crane in the area. This is misrepresentation of facts, and against Section 8(vi) of the EIA notification 2006.

Shifting agriculture (*jhum*) is a dominant traditional land use in the hills of Northeast India and plays a critical role in the livelihoods of people, maintaining agricultural biodiversity and providing food security. Increasing pressures on land have resulted in the shortening of *jhum* cycles (the length of the fallow period between two cropping phases), thus impacting the ecological viability of this farming system. The submergence of land by hydel projects will further shorten the *jhum* cycle and enhance the pressure on the surrounding areas, thus affecting the environment and the livelihoods of *jhum*-dependent communities over a much larger landscape (Vaghlikar and Das 2010).

It is known that existing projects like the Gumti (Tripura) and the Loktak (Manipur) have had long-term negative impacts on the people of the region. Loktak hydroelectric project, commissioned in the 1980s, has impacted the wetland ecology of the Loktak Lake in Manipur, seriously affecting the habitat of the endangered Sangai or Brow-antlered Deer. The Kaptai Dam, built in the Chittagong Hill Tracts of East Pakistan (now Bangladesh) had submerged the traditional homelands of the Hajong and Chakma communities, and forced them to migrate into Northeast India, leading to conflicts between the refugees and local communities. The imminent loss of home, land, and livelihood led to the opposition to many other dams such as the Pagladiya in Assam and Tipaimukh in Manipur (Menon and Kohli 2005).

Several recent media reports claim that India is a power surplus nation with possible intent to export electricity to neighbouring countries! But does producing more power for profit at the cost of loss of some of the pristine forests and wildlife make sense? We probably fail to understand or are not willing to accept that these are the very forests that are catchment for the Brahmaputra, Teesta, and other rivers of northeast India. Degradation of the catchment forests will not just affect the rainfall pattern; but will also result in greater silt flow into the reservoir, thereby reducing the life of the dam. Though some dams may be necessary as a water resource and for power generation, but certainly damming all rivers is not a wise move.

It is also a known fact that high productivity of near shore oceans and marine fishery largely depend on freshwater inputs through rivers. In fact, the large scale near shore fisheries of West Bengal and Bangladesh are hugely influenced by organic sediments that the Brahmaputra brings in. Damming its tributaries and destroying the catchment forests will create another set of ecological refugees, in the form of coastal fishing communities.

To conclude, Northeast India has been identified as India's 'future powerhouse', and will have at least 168 large hydroelectric projects. These are envisioned to aid in the 'development' of the region, but from the conservation point of view, these are set to majorly alter the riverscape, and large dams are emerging as a major issue of conflict in the region. India has enough of examples to learn of the lessons of ecological and social costs of large dams, but whether we will learn from our past mistakes is a question to ponder upon.

Deepak Apte & Parveen Shaikh

#### References

- MENON, M. & K. KOHLI (2005): Large dams for hydropower in northeast India: A dossier. Published by Kalpavriksh.
- MENON, M., N. VAGHOLIKAR, K. KOHLI & A. FERNANDES (2003): Large dams in the Northeast – a bright future? *The Ecologist Asia* 11(1) January–March.
- RAJSHEKHAR, M. (2016): The mess in Arunachal Pradesh that no one is talking about. News Analysis. <https://scroll.in/article/802708/why-private-companies-want-to-give-their-hydel-projects-in-arunachal-to-nhpc>. Accessed in May 2017.
- VAGHOLIKAR, N. (2008): Lies...Dammed Lies Untruth Compromise India's Ecology Security. *Sanctuary Asia* August 2008.
- VAGHOLIKAR, N. & P.J. DAS (2010): Damming the Northeast. Kalpavriksh, Aaranyak and ActionAid India. Pune/Guwahati/New Delhi.

## NEW RECORDS OF OPISTHOBRANCH FAUNA (MOLLUSCA: HETEROBRANCHIA) FROM ANDAMAN & NICOBAR ISLANDS, INDIA

DEEPAK APTE<sup>1,\*</sup>, SUMER VERMA<sup>2</sup> AND DIGANT DESAI<sup>3</sup>

<sup>1</sup>Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Mumbai 400 001, Maharashtra, India.

Email: da.apte@bnhs.org, spiderconch@gmail.com

<sup>2</sup>Reef Watch Marine Conservation, Bandra (W), Mumbai 400 050, Maharashtra, India. Email: sumerverma@yahoo.com

<sup>3</sup>3901 Chandelier Court, 9th floor, Manjrekar lane (Gandhi Nagar), Dr. E Moses Road, Worli Naka, Mumbai 400 018, Maharashtra, India.

Email: diggydesai@hotmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114420

The present study was carried out over two years between 2013 and 2015 along the Andaman & Nicobar Islands, and yielded 128 species, of which 30 species are new records to Indian waters. Aglajidae, Actinocyclusidae, and Dendrodorididae is represented by 1 species each; Chromodorididae – 17 species, Discodorididae and Polyceridae – 3 species each, and Facelinidae – 4 species. Deeper waters between 25 and 40 m still remain relatively unexplored over vast territory in India in general and Andaman & Nicobar Islands in particular. Thus, more focused studies from these depths may reveal many more undocumented opisthobranch fauna.

**Key words:** India, Andaman, Nicobar, Nudibranchia, Opisthobranch, Sea slugs

### INTRODUCTION

A recent study by Bhawe and Apte (2013) revealed that 311 species of Opisthobranchs are known from India distributed over 7 orders, 53 families and 141 genera. There are a few new additions by various authors subsequent to this study (Apte and Bhawe 2014; Carmona *et al.* 2014; Carmona *et al.* 2016; Poria *et al.* 2015; Prasade *et al.* 2015) taking the total count of Indian Opisthobranchia to over 350 species. Exact enumeration of opisthobranch diversity in India remains a challenge due to several non peer-reviewed publications and reports.

Among important coastal and marine biodiversity areas of India, the Andaman & Nicobar Islands represent one of the important coral reef, mangrove and seagrass ecosystems. They comprise 572 islands, islets and rocks in the southeastern part of the Bay of Bengal.

The opisthobranch fauna of the Andaman & Nicobar Islands received focused attention in the recent past through the works of Subba Rao and Dey (2000), Ramakrishna *et al.* (2010), Sreeraj *et al.* (2010, 2012a, b, 2013) and Venkataraman *et al.* (2015). Other recent works on opisthobranchs of the Andaman & Nicobar Islands include Baskaran *et al.* (2013), Dhivya *et al.* (2012), Narayana and Mohanraju (2013), Sachithananadam *et al.* (2011), and Shakthivel *et al.* (2014).

### MATERIAL AND METHODS

Diving expeditions were made during the study period at various sites (Fig. 1) and high resolution images were taken of all the opisthobranch species encountered. No specimens

were collected due to the lack of collection permission. The identification of species was done purely based on external characters. Since for most of the species the morphological characters are distinct, high resolution images were taken to study rhinophores, gills, mantle, and colour. All species described in the text were photographed at subtidal depth between 15–40 m, except *Hallaxa elongata* and *Mexichromis lemniscata*, which were found in the intertidal area where a few surveys were conducted.

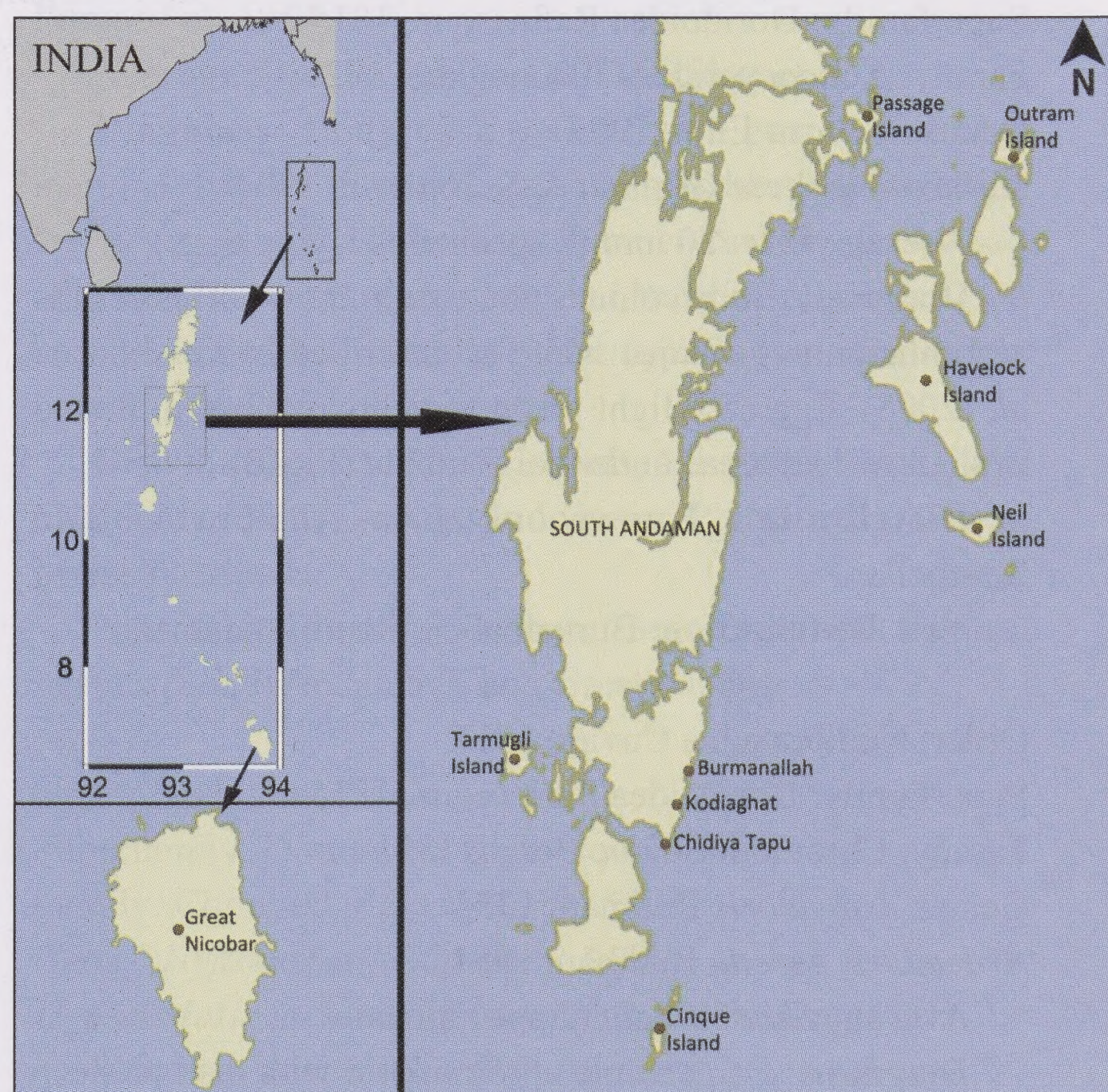


Fig 1: Study sites for opisthobranch fauna in the Andaman & Nicobar islands

## DESCRIPTION

Phylum: Mollusca Linnaeus, 1758

Class: Gastropoda Cuvier, 1795

Subclass: Heterobranchia Burmeister, 1837

Infraclass: Opisthobranchia Milne-Edwards, 1848

Order: Cephalaspidea P. Fischer, 1883

Superfamily: Philinoidea Gray, 1850 (1815)

Family: Aglajidae Pilsbry, 1895 (1847)

Genus: *Chelidonura* A. Adams, 1850

*Chelidonura amoena* Bergh, 1905

**Average Size:** 30 mm (2 specimens).

**Diagnosis:** Willan and Cattaneo-Vietti (1995) provided comprehensive details of the species and stated that it shows considerable variation in colour with the possibility of the presence of hybrid of *Chelidonura amoena* and *C. electra*.

Colour of present specimen dark reddish-brown anteriorly, fading progressively towards posterior end. Caudal lobes creamy white with fine brown reticulation. Left caudal lobe about 2.5 times the size of right lobe. Entire mantle covered with fine white specks (Fig. 2).

**Distribution:** Tropical western Pacific, eastern Indian Ocean–Indonesia, Australia. Palau, Okinawa (Japan), Malaysia, Philippines, Taiwan.

**New Distribution:** Great Nicobar.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Actinocyclusidae O'Donoghue, 1929

Genus: *Hallaxa* Eliot, 1909

*Hallaxa elongata* Gosliner & S. Johnson, 1994

**Average Size:** 20 mm (2 specimens laying eggs).

**Diagnosis:** Body colour light to deep brown. Tips of gills and rhinophores opaque white as described by Gosliner *et al.* (2008). Egg case light green to yellowish green. Found in shallow reef areas under coral rubble (Fig. 3).

**Distribution:** Known only from Aldabra Atoll in Seychelles.

**New Distribution:** Burmanallah, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Ardeadoris* Rudman, 1984

*Ardeadoris egretta* Rudman, 1984

**Average Size:** 40 mm (2 specimens).

**Diagnosis:** Large white chromodorid with distinct deep yellowish orange marginal band. Rhinophores and gills have distinct translucent white band from tip to bottom (Fig. 4).

**Distribution:** Australia, Indonesia, Philippines, Papua New Guinea, Japan.

**New Distribution:** Chidiya Tapu and Cinque Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Chromodoris* Alder and Hancock, 1855

*Chromodoris annae* Bergh, 1877

**Average Size:** 35 mm (2 specimens).

**Diagnosis:** Large chromodorid with deep blue mantle having black specks, and encircled by three distinct bands: black, white, and yellow. Rhinophores and gills deep orange (Fig. 5).

**Distribution:** Australia, Indonesia, Philippines, New Guinea, Japan, Guam, Marshall Islands, Christmas Island, Vanuatu.

**New Distribution:** Chidiya Tapu, South Andaman.

*Chromodoris diana* Gosliner & Behrens, 1998

**Average Size:** 45 mm (2 specimens).

**Diagnosis:** Large blue chromodorid, punctated white. Mantle has distinct white margin and discontinuous black band encircling medial area. Distinct black spot present between rhinophores, which are yellow with white base. Gills yellow on upper half, white on basal half (Fig. 6).

**Distribution:** Indonesia, Philippines, Guam, Malaysia, Japan.

**New Distribution:** Neil and Cinque Island, South Andaman.

*Chromodoris hamiltoni* Rudman, 1977

**Average Size:** 50 mm (2 specimens).

**Diagnosis:** Large chromodorid with central blue coloration, having a distinct black band which is broken near head region. Mantle with three distinct black bands; one central and two originating from base of rhinophores which terminate at base of gills. Margin with deep orange band. Gills and rhinophores orange (Fig. 7).

**Distribution:** South Africa, Tanzania, Kenya, Madagascar.

**New Distribution:** Neil Island, South Andaman.

*Chromodoris joshi* Gosliner & Behrens, 1998

**Average Size:** 50 mm (3 specimens).

**Diagnosis:** Specimens match the description of Gosliner and Behrens (1998). Large golden yellow chromodorid with white flecks. Black band encircles dorsal surface, starting from anterior end of notum and ending just behind gills. Central longitudinal line runs between rhinophores to the

base of gill pocket. Rhinophores dark golden yellow, gills light yellow-white (Fig. 8).

**Distribution:** Philippines, Indonesia, Thailand.

**New Distribution:** Chidiya Tapu and Neil Island, South Andaman.

*Chromodoris lochi* Rudman, 1982

**Average Size:** 10–25 mm (several specimens).

**Diagnosis:** Pale bluish white with dark black submarginal band encircled with deep blue band. Central longitudinal line starts at base of rhinophores, which is broken centrally and ends at the base of gill pocket. Rhinophores and gills pink (Fig. 9).

**Distribution:** Australia, Philippines, Fiji, New Caledonia, Singapore, Vanuatu, Tonga, New Guinea.

**New Distribution:** Outram Island, South Andaman.

*Chromodoris magnifica* (Quoy and Gaimard, 1832)

**Synonym:** *Doris magnifica* Quoy and Gaimard, 1832

**Average Size:** 50–60 mm (several specimens).

**Diagnosis:** The species shows highly variable colour but is usually bluish white. The specimens found in Andaman are white on the outer edge while central part has bluish tinge. On the mantle, bluish area is outlined by three continuous black lines. Margin of mantle bordered with a large white band having a central orange band. Rhinophores and gills deep red orange (Fig. 10).

**Distribution:** Australia, Philippines, New Guinea, Malaysia, Indonesia, Japan.

**New Distribution:** Outram Island, South Andaman.

*Chromodoris willani* Rudman, 1982

**Average Size:** 30 mm (2 specimens).

**Diagnosis:** The species can range in colour from dark blue to a translucent white. The specimens found in Andaman are bluish white. Dorsum has black stripes with centremost one discontinuous. Opaque white spots on rhinophores and gills diagnostic (Fig. 11).

**Distribution:** Vanuatu, Philippines, Indonesia, Malaysia, Guam, Japan (Okinawa).

**New Distribution:** Outram Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Goniobranchus* Pease, 1866

*Goniobranchus coi* (Risbec, 1956)

**Synonym:** *Chromodoris coi* (Risbec, 1956); *Glossodoris coi* Risbec, 1956.

**Average Size:** 30–35 mm (several specimens).

**Diagnosis:** Outer part of dorsum light brown to yellow, separated from inner light chestnut brown part by a wavy white and cherry red or black line. Mantle brown, edged with a dark purple line. Gills and rhinophores vary from translucent white, pale-yellow to light-brown (Fig. 12).

**Distribution:** Vietnam to Australia, Fiji, New Guinea, Indonesia, Philippines, Papua New Guinea, Japan, Marshall Islands.

**New Distribution:** Great Nicobar and Chidiya Tapu, Cinque, Neil, Havelock Islands, South Andaman.

*Goniobranchus collingwoodi* (Rudman, 1987)

**Synonym:** *Chromodoris collingwoodi* Rudman, 1987.

**Average Size:** 35 mm (single specimen).

**Diagnosis:** Dorsum reddish-brown with white spots. Mantle skirt has yellow and purple spots. Discontinuous purple marginal band visible. Rhinophores dark brown and lamellate, with white specks. Rhinophoral base transparent to opaque white. Gills light brown with a white band on outer margin. Rim of gill pocket lined by bluish-white spots. Tail bears yellow and purple spots (Fig. 13).

**Distribution:** Australia, Fiji, New Caledonia, Papua New Guinea, Indonesia, China, Japan, Malaysia.

**New Distribution:** Outram Island, South Andaman.

*Goniobranchus kuniei* (Pruvot-Fol, 1930)

**Synonym:** *Chromodoris kuniei* Pruvot-Fol, 1930; *Glossodoris kuniei* (Pruvot-Fol, 1930); *Glossodoris ransoni* Pruvot-Fol, 1954.

**Average Size:** 55 mm (several specimens).

**Diagnosis:** Body dark yellow with purple and blue marginal bands. Mantle bears numerous black spots which are surrounded by fluorescent blue coloration. Basal half of rhinophores non-lamellate and translucent with white specks, upper half lamellate and light brown. Gills light brown (Fig. 14).

**Distribution:** Christmas Islands, Australia, Tonga, New Caledonia, New Guinea, Indonesia, Philippines, Guam, Marshall Islands.

**New Distribution:** Chidiya Tapu, Neil and Outram Islands (South Andaman), and Great Nicobar.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Hypselodoris* Stimpson, 1855

*Hypselodoris iacula* Gosliner and R.F. Johnson, 1999

**Average Size:** 35 mm (2 specimens).

**Diagnosis:** The specimen found matched perfectly the description by Gosliner *et al.* (2008). Body translucent



Fig. 2: *Chelidonura amoena* Bergh, 1905

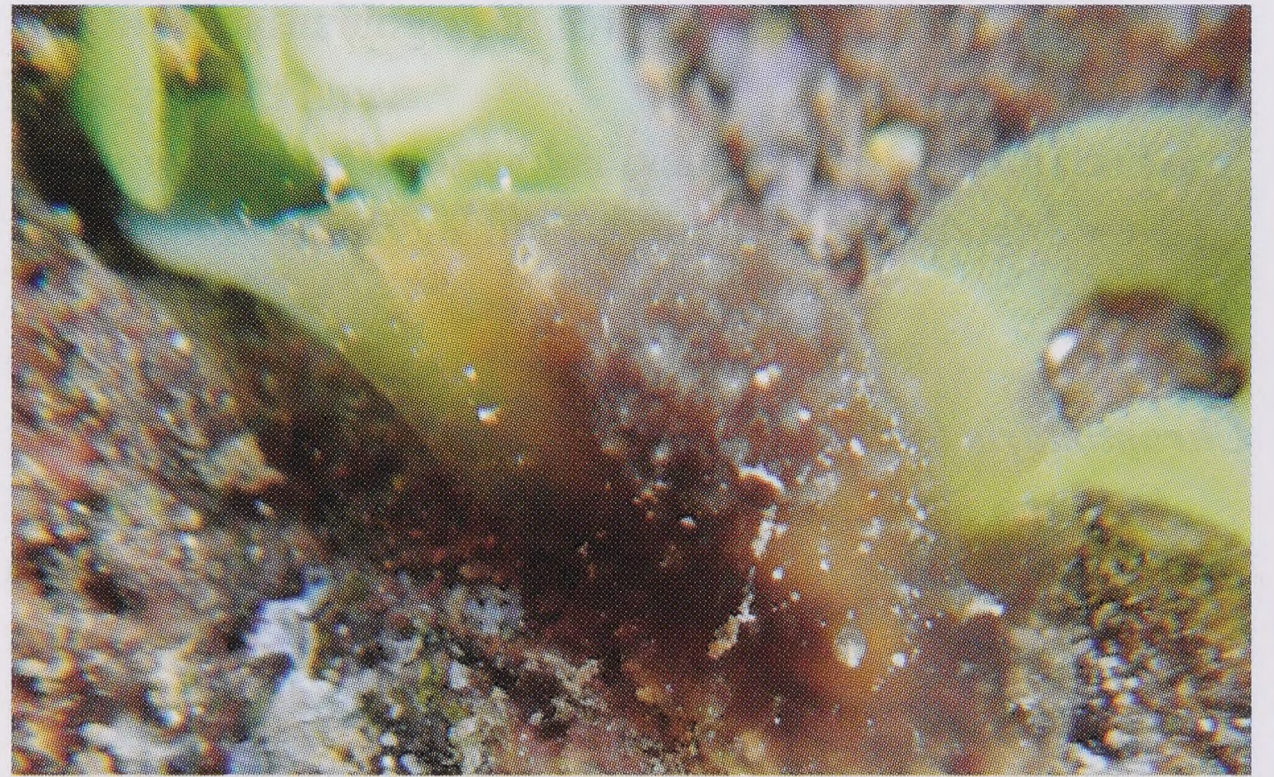


Fig. 3: *Hallaxa elongata* Gosliner & S. Johnson, 1994



Fig. 4: *Ardeadoris egretta* Rudman, 1984



Fig. 5: *Chromodoris annae* Bergh, 1877



Fig. 6: *Chromodoris diana* Gosliner & Behrens, 1998



Fig. 7: *Chromodoris hamiltoni* Rudman, 1977



Fig. 8: *Chromodoris joshi* Gosliner & Behrens, 1998



Fig. 9: *Chromodoris lochi* Rudman, 1982



Fig. 10: *Chromodoris magnifica* (Quoy and Gaimard, 1832)



Fig. 11: *Chromodoris willani* Rudman, 1982



Fig. 12: *Goniobranchus coi* (Risbec, 1956)



Fig. 13: *Goniobranchus collingwoodi* (Rudman, 1987)



Fig. 14: *Goniobranchus kuniei* (Pruvot-Fol, 1930)



Fig. 15: *Hypselodoris iacula* Gosliner and R.F. Johnson, 1999



Fig. 16: *Hypselodoris purpureomaculosa* Hamatani, 1995



Fig. 17: *Hypselodoris tryoni* (Garrett, 1873)



Fig. 18: *Diversidoris crocea* (Rudman, 1986)



Fig. 19: *Mexichromis trilineata* (A. Adams and Reeve, 1850)



Fig. 20: *Mexichromis lemniscata* (Quoy and Gaimard, 1832)



Fig. 21: *Halgerda carlsoni* Rudman, 1978



Fig. 22: *Taringa halgerda* Gosliner and Behrens, 1998



Fig. 23: *Jorunna parva* (Baba, 1938)



Fig. 24: *Dendrodoris guttata* (Odhner, 1917)



Fig. 25: *Favorinus tsuruganus* Baba & Abe, 1964



Fig. 26: *Godiva rachelae* Rudman, 1980



Fig. 27: *Phyllodesmium briareum* (Bergh, 1896)



Fig. 28: *Phyllodesmium macphersonae* (Burn, 1962)



Fig. 29: *Polycera abei* (Baba, 1960)



Fig. 30: *Nembrotha chamberlaini* Gosliner and Behrens, 1997



Fig. 31: *Nembrotha cristata* Bergh, 1877

pinkish-white with scalloped dark orange mantle margin and interrupted by opaque white spots. Purple spot present at apex of each scallop. Network of white lines covers dorsum. Rhinophores and gills orange (Fig. 15).

**Distribution:** Known only from eastern Indian Ocean and western Pacific (Thailand, Indonesia, Philippines).

**New Distribution:** Neil and Havelock Island, South Andaman.

*Hypselodoris purpureomaculosa* Hamatani, 1995

**Average Size:** 25 mm (2 specimens).

**Diagnosis:** Body white with scattered white and deep

reddish purple spots. Orange marginal band distinct. Margins of rhinophoral sheath and gill pocket deep purple. Gills and rhinophores deep orange (Fig. 16).

**Distribution:** Indonesia, Philippines, Japan, Solomon Islands.

**New Distribution:** Chidiya Tapu, Neil Island, South Andaman

*Hypselodoris tryoni* (Garrett, 1873)

**Synonyms:** *Chromodoris odhneri* (Risbec, 1953); *Chromodoris tryoni* (Garrett, 1873); *Glossodoris* (*Chromodoris*) *odhneri* Risbec, 1953; *Glossodoris odhneri* Risbec, 1953;

*Goniodoris tryoni* Garrett, 1873; *Jeanrisbecia francoisi* (Odhner, 1934), *Risbecia francoisi* Odhner, 1934; *Risbecia odhneri* Risbec, 1953; *Risbecia tryoni* (Garrett, 1873).

**Average Size:** 25 mm (several specimens).

**Diagnosis:** The colour is dark tan with black spots. Each black spot is encircled with white. Blue marginal band is clearly visible. Rhinophores are lamellate with light purple stalk. Gills are light brown with outer margin of gill lamellae possessing dark brown band (Fig. 17).

**Distribution:** Indonesia, Philippines, Japan, Australia, Papua New Guinea, Malaysia, Palau, and Marshall Islands. The species was photographed from Pondicherry (now Puducherry), east coast of India (unpublished record).

**New Distribution:** Chidiya Tapu, Neil Island, Cinque, Passage Island (South Andaman), Great Nicobar.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Diversidoris* Rudman, 1987

*Diversidoris crocea* (Rudman, 1986)

**Synonym:** *Noumea crocea* Rudman, 1986

**Size:** 25 mm (2 specimens).

**Diagnosis:** Previously known as *Noumea crocea* Rudman, 1986, recently redesignated as *Diversidoris crocea* (Rudman, 1986) by Johnson and Gosliner (2012).

Body uniformly light yellowish-green with undulating mantle margin having white marginal band. Colour of gills and rhinophores same as body colour. Rhinophores lamellate. Tail long, almost equals size of body (Fig. 18).

**Distribution:** Indonesia, Philippines, Japan, Australia, Papua New Guinea, Solomon Islands, Marshall Islands.

**New Distribution:** Outram Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Mexichromis* Bertsch, 1977

*Mexichromis trilineata* (A. Adams and Reeve, 1850)

**Synonym:** *Chromodoris virgata* Bergh, 1905; *Goniodoris trilineata* A. Adams & Reeve, 1850; *Pectenodoris trilineata* (A. Adams & Reeve, 1850).

**Average Size:** 25 mm (1 specimen).

**Diagnosis:** Previously known as *Pectenodoris trilineata* (A. Adams & Reeve, 1850), it was recently redesignated as *Mexichromis trilineata* (A. Adams & Reeve, 1850) by Johnson and Gosliner (2012).

Uniformly purple with white mantle margin. Dorsum bears three longitudinal lines. Each line deep yellow, edged white. Foot also bears white edge. Gills and rhinophores deep orange

red. Egg case a single circular ribbon, white in colour (Fig. 19).

**Distribution:** Indonesia, Philippines, Australia, Papua New Guinea, Palau.

**New Distribution:** Passage Island, South Andaman.

*Mexichromis lemniscata* (Quoy and Gaimard, 1832)

**Synonym:** *Chromodoris clitonota* Bergh, 1905; *Chromodoris luxuriosa* Bergh, 1875; *Chromodoris scurra* Bergh, 1874; *Chromodoris variegata* Pease, 1871; *Doris dorsalis* Gould, 1852; *Doris lemniscata* Quoy and Gaimard, 1832; *Durvilledoris lemniscata* (Quoy and Gaimard, 1832); *Glossodoris clitonota* (Bergh, 1905); *Glossodoris lemniscata* (Quoy and Gaimard, 1832).

**Average Size:** 12–15 mm (several specimens).

**Diagnosis:** Previously known as *Durvilledoris lemniscata* (Quoy and Gaimard, 1832), it was recently redesignated as *Mexichromis lemniscata* (A. Adams and Reeve, 1850) by Johnson and Gosliner (2012).

Purple mantle bordered by white band. Central part of mantle has broad white band running from rhinophores to gill pocket. On each side of this white band a thin wine red line followed by yellowish band that runs from rhinophores back to gills. Basal half of rhinophore red, followed by purple and blue bands (Fig. 20).

**Distribution:** Fiji, Reunion Islands, Australia, French Polynesia, Saudi Arabia (Sea Slug Forum), South Africa, Madagascar, Red Sea, Thailand, Vanuatu, Marshall Islands.

**New Distribution:** Burmanallah, Kodiaghat, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Discodorididae Bergh, 1891

Genus: *Halgerda* Bergh, 1880

*Halgerda carlsoni* Rudman, 1978

**Average Size:** 35 mm (2 specimens).

**Diagnosis:** Light cream to white in colour with highly tuberculate surface. Each tubercle has orange tips, and these tubercles form interrupted ridges. Minute orange spots scattered on the body. Gills and rhinophores possess brown mottling (Fig. 21).

**Distribution:** Vanuatu, Fiji, New Guinea, Tonga, Japan, Solomon Islands.

**New Distribution:** Cinque and Tarmungli Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Discodorididae Bergh, 1891

Genus: *Taringa* Er. Marcus, 1955

*Taringa halgerda* Gosliner and Behrens, 1998

**Average Size:** 35 mm (2 specimens).

**Diagnosis:** White with low flat yellow tubercles scattered over central region of mantle. Translucent white gills large and lined with black. Rhinophores deep purple to black. Rhinophoral sheath also bears yellow tubercles (Fig. 22).

**Distribution:** Australia, Philippines, Papua New Guinea, Malaysia.

**New Distribution:** Chidiya Tapu, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Discodorididae Bergh, 1891

Genus: *Jorunna* Bergh, 1876

*Jorunna parva* (Baba, 1938)

**Average Size:** 20 mm (1 specimen).

**Diagnosis:** Bright yellow with scattered black papillae. Black caryophyllidia clustered to form large black spots. Gills have black branchial veins. Rhinophores black with translucent base. A large black spot on posterior tip of foot distinctly visible (Fig. 23).

**Distribution:** Mariana Islands (Sea Slugs Forum), Korea (Daewui *et al.* 2013), Tanzania, Okinawa (Japan), Seychelles, Philippines, Papua New Guinea (Yolanda *et al.* 2008).

**New Distribution:** Cinque Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Phyllidioidea Rafinesque, 1814

Family: Dendrodorididae O'Donoghue, 1924 (1864)

Genus: *Dendrodoris* Ehrenberg, 1831

*Dendrodoris guttata* (Odhner, 1917)

**Average Size:** 30 mm (2 specimens).

**Diagnosis:** Deep orange body/mantle with deep red spots. Gills bushy. Rhinophores translucent at base with white tips (Fig. 24).

**Distribution:** Japan (Hirose *et al.* 2015), Hong Kong (Jensen 1998), Korea, Indonesia, and across the Indo-West Pacific (Rudman 2000).

**New Distribution:** Cinque Island (South Andaman), Great Nicobar.

Order: Nudibranchia Cuvier, 1817

Superfamily: Aeolidioidea J.E. Gray, 1827

Family: Facelinidae Bergh, 1889

Genus: *Favorinus* M.E. Gray, 1850

*Favorinus tsuruganus* Baba & Abe, 1964

**Average Size:** 20 mm (1 specimen).

**Diagnosis:** Translucent white body. Cerata short with deep orange digestive glands. Tip of each cerata bluish

black. Antennae smooth and white. Rhinophores dark brown, bearing three lamellae (Fig. 25).

**Distribution:** Reunion Island, Red Sea, New Zealand, Australia, New Caledonia, Papua New Guinea, Indonesia, Philippines, Japan.

**New Distribution:** Cinque Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Aeolidioidea J.E. Gray, 1827

Family: Facelinidae Bergh, 1889

Genus: *Godiva* Macnae, 1954

*Godiva rachelae* Rudman, 1980

**Average Size:** 25 mm (several specimens).

**Diagnosis:** Translucent white body. Head region has opaque white marking and orange line. Oral tentacle also bears faint orange line. Cerata with orange, blue, and white bands: orange at base and white at apex. Usually found on coral sand. (Fig. 26).

**Distribution:** Tanzania, Australia.

**New Distribution:** Havelock Island, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Aeolidioidea J.E. Gray, 1827

Family: Facelinidae Bergh, 1889

Genus: *Phyllodesmium* Ehrenberg, 1831

*Phyllodesmium briareum* (Bergh, 1896)

**Synonym:** *Ennoia briareus* Bergh, 1896.

**Average Size:** 35 mm (1 specimen).

**Diagnosis:** Light brown body. Cerata long, curly and cylindrical with yellow tips. Oral tentacles also with yellow tip (Fig. 27).

**Distribution:** Singapore, Australia, Vanuatu, Papua New Guinea, Indonesia, Philippines, Malaysia, Japan.

**New Distribution:** Great Nicobar.

*Phyllodesmium macphersonae* (Burn, 1962)

**Synonym:** *Cratena macphersonae* Burn, 1962.

**Average Size:** 35 mm (2 specimens).

**Diagnosis:** Body white with numerous fine brown spots. Cerata long, curved, having opaque white and brown mottling, blue band and white apex. Oral tentacles have white tips and brown spots (Fig. 28).

**Distribution:** Australia, Indonesia, Philippines, Malaysia.

**New Distribution:** Havelock Island (South Andaman), Great Nicobar.

Order: Nudibranchia Cuvier, 1817

Superfamily: Polyceroidea Alder and Hancock, 1845

Family: Polyceridae Alder and Hancock, 1845

Genus: *Polycera* Cuvier, 1817

***Polycera abei* (Baba, 1960)****Synonym:** *Greilada abei* Baba, 1960.**Average Size:** 15 mm (2 specimens).**Diagnosis:** Deep orange body with distinct black spots. Rhinophore base deep orange with dark blackish brown upper half. Gills black (Fig. 29).**Distribution:** Japan, UAE, Philippines, Indonesia, Hawaii Islands.**New Distribution:** Chidiya Tapu, South Andaman.

Order: Nudibranchia Cuvier, 1817

Superfamily: Polyceroidea Alder and Hancock, 1845

Family: Polyceridae Alder and Hancock, 1845

Genus: *Nembrotha* Bergh, 1877***Nembrotha chamberlaini*** Gosliner and Behrens, 1997**Average Size:** 55 mm (3 specimens).**Diagnosis:** White with dark brown markings. Rhinophores dark red, gills dull red to purple brown. Oral veil deep blue (Fig. 30).**Distribution:** Philippines, Indonesia, Japan.**New Distribution:** Outram Island (South Andaman), Great Nicobar.***Nembrotha cristata* Bergh, 1877****Average Size:** 90 mm (2 specimens).**Diagnosis:** Large opisthobranch with black body, large green rounded tubercles. Rhinophores are lamellate with green rhinophoral sheath. Gills also green (Fig. 31).**Distribution:** Maldives, Australia, Philippines, Indonesia, Papua New Guinea, Solomon Islands, Malaysia, Palau,

Marshall Islands, Japan.

**New Distribution:** Great Nicobar.**DISCUSSION**

In the present study, we observed 128 species of opisthobranchs, of which 30 are new records to the Andaman & Nicobar Islands as well as to Indian waters (Figs 2–31). Only new records are described here in detail. Unless otherwise specified, the worldwide distribution is reproduced from Gosliner *et al.* (2008, 2015). Also, various online portals such as Sea Slug Forum, WoRMS and Nudipixel were referred to list distributional records. Despite several studies in the recent past, new finds of opisthobranchs from the Andaman-Nicobar Archipelago are not uncommon. There may still be several unrecorded cryptic species from this region requiring further habitat-specific and host-specific studies.

**ACKNOWLEDGEMENTS**

This paper is the result of fieldwork conducted during Project Giant Clam of the BNHS. The authors take this opportunity to thank MoEFCC, Government of India (under All India Co-ordinated Project on Taxonomy – Mollusca) and Whitley Fund for Nature. The authors thank the Forest Department of Andaman & Nicobar division for their continued support; Ron Silver, Hsini Lin, Lindz Warren, and Vishal Bhawe for assistance in identification of some species; and Vardhan Patankar who recorded and provided image of *Dendrodoris guttata*.

**REFERENCES**

- APTE, D.A. & V. BHAVE (2014): New records of opisthobranchs from Lakshadweep, India (Mollusca: Heterobranchia). *Journal of Threatened Taxa* 6(3): 5562–5568.
- BASKARAN, R., I. ANANDEVELU, N. KARPOORASUNDARAPANDIAN, P.M. MOHAN & G. PADMAVATI (2013): First record of *Hervilla mietta* from the Andaman Islands, Indian Ocean (Nudibranchia: Aeolidina: Glaucidae). *Marine Biodiversity Records* 6: e64. doi: 10.1017/S1755267213000444
- BHAVE, VISHAL & D.A. APTE (2013): Chapter 5 - Current Status of Indian Opisthobranch Fauna. *Ecology and Conservation of Tropical Marine Faunal Communities*. Springer-Verlag, Berlin Heidelberg, 2013. ISBN: 978-3-642-38199-7. 63–79.
- CARMONA, L., V. BHAVE, R. SALUNKHE, M. POLA, T.M. GOSLINER & J.L. CERVERA (2014): Systematic review of *Anteaeolidiella* (Mollusca, Nudibranchia, Aeolidiidae) based on morphological and molecular data, with a description of three new species. *Zool. J. Linn. Soc.* 171(1): 108–132.
- CARMONA LEILA, JUAN LUCAS CERVERA, APPUKUTTANNAIR BIJU KUMAR & B.K. SNEHA CHANDRAN (2016): First record of the Aeolid *Anteaeolidiella fijensis* (Nudibranchia, Aeolidiidae) from India. *Marine Biodiversity*. doi: 10.1007/s12526-016-0507-0.
- DAEWUI JUNG, JONGRAK LEE & CHANG-BAE KIM (2013): New records of four Doridoidean nudibranchs from Korea. *Anim. Syst. Evol. Divers.* 29(2): 191–197. doi: 10.5635/ASED.2013.29.2.191
- DHIVYA, P., V. SACHITHANANDAM & P.M. MOHAN (2012): New records on the opisthobranch fauna of the Andaman Islands, India. *Indian Journal of Geo-Marine Sciences* 41(3): 215–217.
- GOSLINER, T.M. & D.W. BEHRENS (1998): Five new species of *Chromodoris* (Molluscs: Nudibranchia: Chromodorididae) from the tropical Indo-Pacific Ocean. *Proceedings of the California Academy of Sciences* 50(5): 139–165.
- GOSLINER, T.M., Á. VALDÉS & D.W. BEHRENS (2015): *Nudibranch and Sea Slug Identification - Indo Pacific*. New World Publications, Jacksonville, Florida. 408 pp.
- GOSLINER, T.M., D.W. BEHRENS & Á. VALDÉS (2008): *Indo-Pacific Nudibranchs and Sea Slugs: A Field Guide to the World's Most Diverse Fauna*. Sea Challengers Natural History Books and the California Academy of Sciences. 425 pp.
- JENSEN, KATHE R. (1998): Zoogeographic affinities of Hong Kong Opisthobranchia (Mollusca: Gastropoda). Pp. 43–55. *In*: Morton, B. (Ed.): *The marine biology of South China Sea III. Proceedings of the Third International Conference on the Marine Biology of the South China Sea*. Hong Kong October 28 – November 01, 1996, Hong Kong University Press.

- JOHNSON, R.F. & T.M. GOSLINER (2012): Traditional taxonomic groupings mask evolutionary history: A molecular phylogeny and new classification of the chromodorid nudibranchs. *PLoS ONE* 7(4): e33479.
- HIROSE, M., E. HIROSE & M. KIYOMOTO (2015): Identification of five species of *Dendrodoris* (Mollusca Nudibranchia) from Japan using DNA barcode and larval characters. *Marine Biodiversity* 45(4): 769–780. doi: 10.1007/s12526-014-0288-2.
- NARAYANA, S. & R. MOHANRAJU (2013): New record of a headshield slug *Phanerophthalmus smaragdinus* (Gastropoda: Opisthobranchia) from Andaman Islands, India. *Journal of Threatened Taxa* 5(7): 4113–4114; doi: 10.11609/JoTT.o3357.4113-4.
- PORIYA, P., B. VAKANI, B. CHAUDHARI, P. KACHHIYA & R. KUNDU (2015): Diversity and first record of heterobranch gastropods (opisthobranchs) from the Saurashtra coast of Kathiawar Peninsula, India. *Mar. Biodivers. Rec.* 8: e82. doi:10.1017/S1755267215000585.
- PRASADE, A., B. PATEL, R. SALUKHE, V. BHAVE & D. APTE (2015): A first record of *Taringa caudata* (Farran, 1905) (Nudibranchia: Discodorididae) from India. *Journal of Threatened Taxa* 7: 7706–7709.
- RAMAKRISHNA, C.R. SEERAJ, C. RAGHUNATHAN, C. SIVAPERUMAN, J.S. YOGESH KUMAR, R. RAGHURAMAN, T. IMMANUEL & P. RAJAN (2010): Guide to Opisthobranchs of Andaman and Nicobar Islands. Zoological Survey of India, Kolkata. 196 pp.
- RUDMAN, W.B. (1998): *Chromodoris aspersa* (Gould, 1852). In: Sea Slug Forum. Australian Museum, Sydney. Retrieved on January 03, 2016 from <http://www.seaslugforum.net/factsheet/chraspe>.
- RUDMAN, W.B. (2000): *Dendrodoris guttata* (Odhner, 1917). Sea Slug Forum, Australian Museum, Sydney. Retrieved on January 03, 2016, from [www.seaslugforum.net/find/dendgutt](http://www.seaslugforum.net/find/dendgutt)
- SACHITHANANADAM, V., P. DHIVYA, P.M. MOHAN, P. MUNESWARAN & R. BASKARAN (2011): First record of *Stylocheliuss striatus* (Mollusca: Gastropoda: Anaspidea: Aplysiidae) from the Andaman Sea, India. *Journal of Oceanography and Marine Science* 2(8): 165–167. doi: 10.5897/JOMS11.018.
- SHAKTIVEL, G., M. HIMA & T. GANESH (2014): Additions to the knowledge of shallow-water opisthobranch molluscs (Gastropoda: Opisthobranchia) with new distributional records to Andaman Islands, India. *International Journal of Science and Nature* 5(2): 249–253.
- SREERAJ, C.R., P.T. RAJAN, R. RAGHURAMAN, C. RAGHUNATHAN, R. RAJKUMAR, T. IMMANUEL & RAMAKRISHNA (2010): On some new records of sea slugs (Class: Gastropoda, Subclass: Opisthobranchia) from Andaman and Nicobar Islands. Pp. 289–298. In: Recent Trends in Biodiversity of Andaman and Nicobar Islands. Zoological Survey of India, Kolkata.
- SREERAJ, C.R., C. SIVAPERUMAN & C. RAGHUNATHAN (2012a): An annotated checklist of opisthobranch fauna (Gastropoda: Opisthobranchia) of the Nicobar Islands, India. *Journal of Threatened Taxa* 4(4): 2499–2509.
- SREERAJ, C.R., C. SIVAPERUMAN & C. RAGHUNATHAN (2012b): Report on ten newly recorded opisthobranchs (Opisthobranchia, Gastropoda) from Andaman and Nicobar Islands, India. *International Journal of Oceanography and Marine Ecological System* 1(2): 50–59.
- SREERAJ, C.R., C. SIVAPERUMAN & C. RAGHUNATHAN (2013): Species diversity and abundance of Opisthobranch Molluscs (Gastropoda: Opisthobranchia) in the coral reef environments of Andaman and Nicobar Islands, India. Pp. 81–106. In: Venkataraman, K., C. Raghunathan & C. Sivaperuman (Eds): Ecology and Conservation of Tropical Marine Faunal Communities. Springer Berlin Heidelberg.
- SUBBA RAO, N.V. & A. DEY (2000): Catalogue of marine molluscs of Andaman and Nicobar Islands. *Rec. zool. Surv. India, Occ. Paper No. 187*, i-x, 323 pp. Pp. 199–294.
- VENKATARAMAN, K., C. RAGHUNATHAN, R. RAGHURAMAN & SUDHANSHU DIXIT (2015): Fascinating Seaslugs and Flatworms of Indian Seas. Zoological Survey of India. 149 pp.
- WILLAN, R.C. & R. CATTANEO-VIETTI (1995): New data on *Chelidonura amoena* Bergh, 1905 (Opisthobranchia: Cephalaspididae: Aglajidae). *The Beagle* 12: 9–18.
- YOLANDA, E. CAMACHO-GARCI & TERRENCE M. GOSLINER (2008): Systematic revision of *Jorunna* Bergh, 1876 (Nudibranchia: Discodorididae) with a morphological phylogenetic analysis. *J. Mollus. Stud.* 74(2): 143–181. doi:10.1093/mollus/eyn002.



## RARE AND INTERESTING BUTTERFLY (LEPIDOPTERA) RECORDS FROM ARUNACHAL PRADESH, INDIA

ARUN P. SINGH<sup>1</sup>

<sup>1</sup>Forest Entomology Division, Forest Research Institute, Dehradun 248 006, Uttarakhand, India.

Email: ranoteaps@gmail.com; singhap@icfre.org

doi: 10.17087/jbnhs/2015/v112i3/114421

The paper presents rare records of 109 taxa including species and subspecies out of 417 taxa of butterflies sampled during a three-year study (December 2011–December 2014), June 03–05, 2015, and March 18, 2016) in 14 districts of Arunachal Pradesh. Information is presented on their altitudinal distribution, seasonality, Indian Wildlife (Protection) Act 1972 status, and their regional distribution based on past records.

**Key words:** Eastern Himalaya, semi-evergreen forest, Lepidoptera, rare, endemic, north-east India

### INTRODUCTION

Arunachal Pradesh is the easternmost state of India bordering Bhutan, Tibet (China) and Myanmar. The Indian states of Assam and Nagaland connect Arunachal with the Indian mainland. Covering an area of about 83,743 sq. km, it forms the major part of the Eastern Himalaya lying between 26.4' – 29.30' N and 90.36' – 97.30' E, approximately 67,905 sq. km of which is under forest cover (FSI 2013). Three broad climatic zones are recognizable in the state. The climate is hot and humid subtropical in the foothills, and cooler in the Lesser Himalaya and alpine zone of the Great Himalaya, beyond which are the upper reaches adjoining Tibet (China) which are under perpetual snow. The average

mean maximum and minimum temperature varies from 29.5 to 17.7 °C in the subtropical humid region and 21.4 to 2.4 °C in the cold region, respectively. In lower valleys, temperatures during June to August are between 30 and 40 °C, annual rainfall in the state averages 3,300 mm, falling mostly between April and September.

### MATERIAL AND METHODS

Random sampling surveys for butterflies were carried out in the state by the author, covering 14 districts (Tirap, Changlang, Lohit, Anjaw, Lower Dibang Valley, Dibang Valley, West Siang, Upper Siang, Lower Subansiri, Upper Subansiri, Papumpare, East Kameng, West Kameng, and

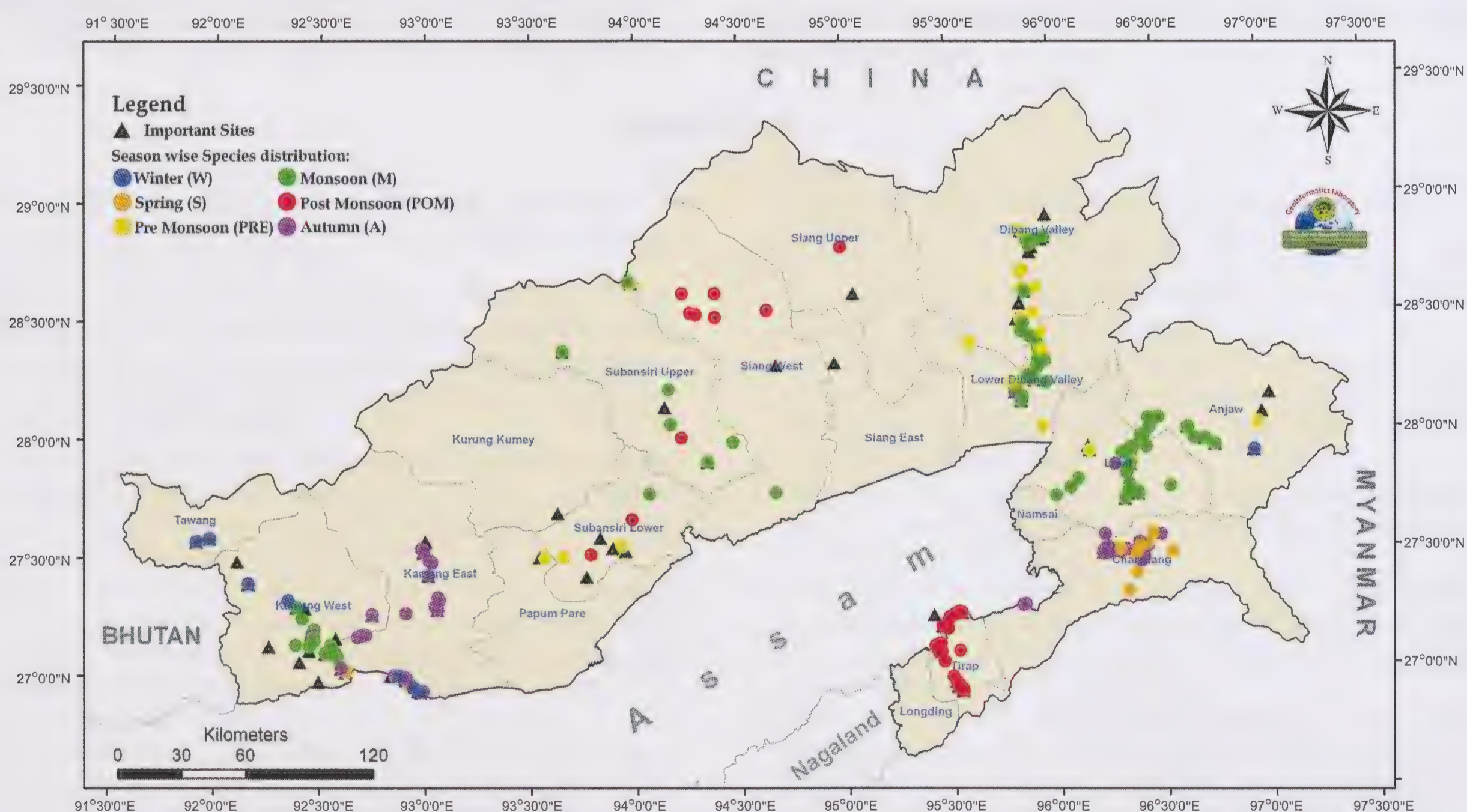


Fig. 1: Seasonal surveys for Butterflies carried out in Arunachal Pradesh, India

Sampling locations marked with different colours according to the seasons when they were surveyed by the author

Tawang) covering all the seasons – January–February: Winter; March–April: Spring; May–June: Summer; July–August: Monsoon; September–October: Post Monsoon; and November–December: Autumn. Sampling surveys were carried out from December 2011 to December 2014; June 03–05, 2015; and March 18, 2016.

A total of 190 transect walks were undertaken, including 2,916 GPS locations on these transects. Survey routes on the road were identified and mapped for butterflies (Fig. 1). The altitudinal gradient covered was from 135 m at Deomali in Tirap district up to 4,000 m at Sela Pass on the border between Tawang and West Kameng districts. Data on abundance of butterflies was recorded. Most of the species were photographed, while specimens of only a few species were taken. In all, 47 specimens (dead and live) were collected from the field that have been placed in Museum, Rain Forest Research Institute, Jorhat, Assam [Display Box (RFRI species no.1–32) and Insect Cabinet (RFRI no.33–36)], while specimens of three species (sp.no. 45, 46 and 50 of Table 1) labelled as RFRI no. 8, 39, and 40, respectively are kept in National Forest Insect Collection at Forest Research Institute, Dehradun.

Identification of butterflies was carried out mainly by comparing images captured in the field with field guides (D'Abrera 1982, 1985, 1986; Evans 1932; Gogoi 2012, 2013a, b; Haribal 1992; Kehimkar 2008; Singh 2011; Smetacek 2015; Smith 1989, 2006; Sondhi and Kunte 2014; Sondhi *et al.* 2013; Wynter-Blyth 1957). Websites <http://www.ifoundbutterflies.org/> and <http://flutters.org/> and a few specimens at the National Forest Insect Collection (NFIC) at Forest Research Institute, Dehradun, Uttarakhand, India, were also used for identification.

## RESULTS AND DISCUSSION

A total of 417 taxa were identified during the three-year sampling period from Arunachal Pradesh. Of these, 107 species (+2 subspecies) were found to be either 'rare' or 'uncommon' or 'restricted to north-east India', with 39 species among these listed under various schedules of the Indian Wildlife (Protection) Act (IWPA), 1972. Notes on these 109 taxa along with a summarized presentation in Table 1 are provided in this paper.

### Papilionidae

**1. Ludlow's Bhutan Glory *Bhutanitis ludlowi* Gabriel, 1942**  
**Status:** Not listed in IWPA (1972).

**Specimens sighted:** Two individuals.

**Locality and Date of sighting:** Recorded between Lama Camp and Sunder View in Eaglenest Wildlife Sanctuary in

West Kameng district at 2,205 m and 2,231 m altitude on 30.vii.2013.

**Notes:** A rare species originally known from a series of five specimens collected in Bhutan during 1933–1934 by the botanists Frank Ludlow and George Sheriff at 2,000–2,200 m in the forest. In August 2009, a Bhutanese forestry officer collected one *Bhutanitis ludlowi* in the Bumdeling Wildlife Sanctuary, in Bhutan's remote Trashiyangtse valley, which provided the first unambiguous evidence in about 75 years that the species was extant. In August 2011, some mating pairs of *B. ludlowi* were sighted and captured at Bumdeling Wildlife Sanctuary by a research team from Bhutan in collaboration with the Butterfly Society of Japan (BSJ) and NHK Japan, where it is sparsely seen in Tarphel in Trashiyangtse Valley, eastern Bhutan between 2,300 and 2,500 m (Wangdi *et al.* 2012).

**2. Brown Gorgon *Meandrusa lachinus lachinus* Frühstorfer, 1902**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens sighted:** Two individuals.

**Locality & Date of sighting:** Two individuals recorded, one in flight and another mud-puddling, both at c. 1,300 m between Hunli and Mayodia Pass in Dibang valley on 31.viii.2013.

**Notes:** Specimens from Khasi Hills (♀: 06.x.1910) and Naga hills (♂: 05.ix.1924 at 1,800 m) collected by O.C. Ollenbach are kept in the NFIC at Forest Research Institute, Dehradun. Distributed from Sikkim to Assam in India (Evans 1932), common in Khasi Hills and also found in Myanmar (Wynter-Blyth 1957). Single record of a male from Namdapha on 21.iv.1981 (Bhattacharya 1985). Recorded between 1,200 and 2,600 m from Kathmandu valley and Kashi district in Nepal during April–May and September–October (Smith 1989), and also from Central Nepal at 1,820 m (Khanal *et al.* 2013). Recorded as far west as Kedarnath Musk Deer Reserve, Chamoli district in Garhwal, Uttarakhand, between 1,800 and 2,150 m, in May, July, and September (Singh 2006). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley district, Arunachal Pradesh below 1,000 m. One male recorded from Trashiyangtse valley, eastern Bhutan at Tarphel at c. 2,500 m in August (Wangdi *et al.* 2012). Recently recorded in March from Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**3. Yellow Gorgon *Meandrusa payeni evan* Doubleday, 1845**  
**Status:** Not listed in IWPA (1972).

**Specimen sighted:** Two individuals recorded.

**Locality and Date of sighting:** One individual sighted on the roadside at 201 m above 'Elephant Flat' near Tippi in West Kameng district on 01.x.2012. The second one recorded at

271 m along a stream adjoining Namdapha river in Namdapha Tiger Reserve in Changlang district on 20.iii.2013. Uncommon. **Notes:** Specimens of this subspecies (♂: 20.vii.1910, ♀: 11.vi.1912) were collected from Khasi Hills by O.C. Ollenbach and are kept in NFIC. It is 'not rare' from Sikkim to Assam (Evans 1932), including Khasi Hills (January and September) up to N. Myanmar (Wynter-Blyth 1957). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Garo Hills in September (Sondhi *et al.* 2013) and during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014).

**4. Great Mormon *Papilio memnon agenor* Linnaeus, 1758** (female form *alcanor*)

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** Two individuals.

**Locality and Date of sighting:** Two females of form *alcanor* were recorded in flight in Deomali forest, Tirap district on 04.vi.2015 at 161 m.

**Notes:** Specimens collected from Upper Siang and Tirap districts (Arora and Mondal 1981). Although the other female forms of this species are recorded as 'common', the female form *alcanor* is 'not rare', and the species is distributed from Sikkim to Myanmar (Evans 1932) and Nepal (Smith 1989).

**5. Great Blue Mime *Papilio paradoxa telearchus* Hewitson, 1852**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens sighted:** 20+ individuals.

**Locality and Date of sighting:** One record on 04.ii.2013 in Pakke Tiger Reserve at 181 m. Seven individuals recorded between 137 and 163 m, 11–14.x.2014, and many (15+) individuals, 03–04.vi.2015, in and around Deomali forest in Tirap district.

**Notes:** Specimens of this subspecies from Myanmar–Pagaiye, Tavoy (♂: 18.vi.1914); Kaliaunaung Forest, Tavoy (♀: 24.vi.1914); Moulmein (♀: 10.iii.1925); and Kamounghla Forest, Tavoy (♂: 08.xi.1920) collected by O.C. Ollenbach are kept in NFIC. 'Rare' from Assam to Myanmar (Evans 1932; Wynter-Blyth 1957). One male collected at 229 m on 05.v.1966 in Denling Forest, Kameng district and another male from Bhalukpong at 213 m, 06.v.1966, by A.N.T. Joseph (Arora and Mondal 1981). Single record of a male from Hornbill in Namdapha on 15.iv.1981 (Bhattacharya 1985). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in July–August (Singh *et al.* 2015). Recorded from Garo Hills in March–May (Sondhi *et al.* 2013) and

from Pakke Tiger Reserve in April (Sondhi and Kunte 2014). Recently recorded at 28 m in March from Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**Pieridae**

**6. Orange Albatross *Appias nero galba* Wallace, 1867**

**Status:** Schedule IV (IWPA 1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** A single record on 02.v.2012 between Tippi and Sessa, West Kameng at 176 m.

**Notes:** Specimens of this subspecies (♂: 10.vi.1925, ♀: 17.iv.1925 at 1,650 m) from Jakhama, Naga hills collected by O.C. Ollenbach are kept in NFIC. It is 'rare' from Sikkim to Myanmar (Evans 1932) including Assam (Wynter-Blyth 1957), also occurs in Naga Hills between April and October and Manipur between August and September. Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Pakke Tiger Reserve in May (Sondhi and Kunte 2014). Recently recorded at 100 m in December by Gogoi in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**7. Red-Spot Sawtooth *Prioneris philonome clemanthe* Doubleday, 1846**

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** Female mud-puddling on wet path on 11.vi.2014 at 550 m in Parshuram Kund, Lohit district.

**Notes:** One specimen from Tavoy, Myanmar (♀: 15.i.1920) collected by O.C. Ollenbach is kept in NFIC at Forest Research Institute, Dehradun. 'Rare' from Sikkim to Myanmar (Evans 1932) including Assam (Wynter-Blyth 1957). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley below 1,000 m.

**8. Dark Blackvein *Aporia harrietae* de Nicéville, 1893**

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** 3+ individuals.

**Locality and Date of sighting:** Recorded below Mayodia pass, Lower Dibang valley between 2,059 and 2,429 m on 06.vi.2014.

**Notes:** This species was thought to be 'very rare' and restricted to Bhutan (Evans 1932), where the subspecies *A. h. harrietae* de Nicéville, 1893 is found. *Aporia harrietae* has now also been recorded in June by Tarun Karmakar and Arjan Basu Roy, from Eaglenest Wildlife Sanctuary adjoining Bhutan (Anon 2017) and subspecies *A. h. baileyi* South, 1914 is known from Mishmi hills (Dichu, 2,743 m) and NE India in Nagaland (Jhakama) (Gasse 2013).

**9. Plain Sulphur** *Dercas lycorias lycorias* Doubleday, 1842  
**Status:** Not listed in IWPA (1972).

**Specimens sighted:** Two individuals.

**Locality and Date of sighting:** Observed on 15.iii.2013

at 1,298 m below Mayodia pass, moving towards Hunli in Dibang valley district.

**Notes:** Specimens from Khasi Hills (♂: 26.iv.1907) and Naga Hills (♀: 01.ix.1924 at 1,650 m) collected by O.C. Ollenbach

**Table 1:** List of Rare and uncommon butterflies recorded in Arunachal Pradesh, India  
 (Dec' 2011–Dec' 2014, 3–5 Jun' 2015 and 18 Mar' 2016)

Sl. No.	Common Name	Scientific Name	Flight Period (Month/s)	Recorded altitude(m)	Number of individuals recorded
<b>PAPILIONIDAE</b>					
1	Ludlow's Bhutan Glory	<i>Bhutanitis ludlowi</i> Gabriel, 1942	July	2,200–2,250	2
2	Brown Gorgon	<i>Meandrusa lachinus lachinus</i> Frühstorfer, 1902	August	1,300	2
3	Yellow Gorgon	<i>Meandrusa payeni evan</i> Doubleday, 1845	March, October	200–300	2
4	Great Mormon	<i>Papilio memnon agenor</i> Linnaeus, 1758 female form <i>alcanor</i>	June	100–200	2
5	Great Blue Mime	<i>Papilio paradoxa telearchus</i> Hewitson, 1852	Feb., June, Oct.	100–200	20+
<b>PIERIDAE</b>					
6	Orange Albatross	<i>Appias nero galba</i> Wallace, 1867	May	100–200	1
7	Red-Spot Sawtooth	<i>Prioneris philonome clemathe</i> Doubleday, 1846	June	500–600	1
8	Dark Blackvein	<i>Aporia harrietae</i> de Nicéville, 1893	June	2,000–2,500	3+
9	Plain Sulphur	<i>Derca lycorias lycorias</i> Doubleday, 1842	March	1,298	2
10	Pale Jezebel	<i>Delias sanaca bhutya</i> Talbot, 1937	Jul.–Sept.	1,200–2,300	5+
<b>LYCAENIDAE</b>					
11	Hooked Oakblue	<i>Arhopala paramuta paramuta</i> de Nicéville, 1883	September	175	1
12	Green Oakblue	<i>Arhopala eumolphus eumolphus</i> Cramer, 1780	Feb., Mar., Dec.	100–200	11
13	Sylhet Oakblue	<i>Arhopala silhetensis silhetensis</i> Hewitson, 1862	December	100–200	10+
14	Glazed Oakblue	<i>Arhopala paraleia</i> Evans, 1925	November	401	1
15	Pale Spark	<i>Sinthusia virgo</i> Elwes, 1887	June	2,057	1
16	Shot Flash	<i>Rapala rediviva</i> Moore, 1879	June	580	1
17	Brilliant Flash	<i>Rapala sphinx sphinx</i> Fabricius, 1775	December	201	1
18	Blue Imperial	<i>Ticherra acte acte</i> Moore, 1889	April, December	100–200	11
19	Straight Pierrot	<i>Caleta roxus roxana</i> de Nicéville, 1897	Aug.–Sept.	100–500	3
20	Forest Pierrot	<i>Taraka hamada mendesia</i> Frühstorfer, 1918	November	479	1
21	Dark Pierrot	<i>Tarucus ananda</i> de Nicéville, 1883	August	480	1
22	Branded Yamfly	<i>Yasoda tripunctata tripunctata</i> Hewitson, 1863	Feb., Aug., Dec.	100–800	8
23	Blue Quaker	<i>Pithecopis fulgens fulgens</i> Doherty, 1889	November	428	1
24	Burmese Sunbeam	<i>Curetis saronis gloriosa</i> Moore, 1883	March	147	1
25	Great Spotted Blue	<i>Phengaris atroguttata</i> Oberthür, 1876	September	1,440	5
26	Moore's Cupid	<i>Shijimia moorei moorei</i> Leech, 1889	August	358–413	2
27	Straightwing Blue	<i>Orthomiella pontis pontis</i> Elwes 1887	March	1,298	2
28	Pointed Lineblue	<i>Lonolyce helicon merguiana</i> Moore, 1884	July	231	1
29	Banded Lineblue	<i>Prosotus aluta coelestis</i> Wood-Mason & de Nicéville, 1886	Aug.–Sept.	100–500	3
30	White-banded Hedge Blue	<i>Lestranicus transpectus</i> Moore, 1879	Nov.–Dec.	300–1,300	2
31	Glistening Cerulean	<i>Jamides elpis pseudelpis</i> Butler, 1879	August	358	1

# RARE AND INTERESTING BUTTERFLY RECORDS FROM ARUNACHAL PRADESH

**Table 1:** List of Rare and uncommon butterflies recorded in Arunachal Pradesh, India  
(Dec' 2011–Dec' 2014, 3-5 June 2015 and 18 March 2016) (Contd.)

Sl. No.	Common Name	Scientific Name	Flight Period (Month/s)	Recorded altitude(m)	Number of individuals recorded
<b>NYMPHALIDAE</b>					
32	Jewelled Nawab	<i>Charaxes delphis delphis</i> Doubleday, 1843	September	137	1
33	Malayan Nawab	<i>Charaxes moori sandakanus</i> Frühstorfer, 1883	August	700	1
34	Tailed Red Forester	<i>Lethe sinorix sinorix</i> Hewitson, 1863	March, Nov.–Dec.	100–650	9
35	Scarce Red Forester	<i>Lethe distans</i> Butler, 1870	March	381	1
36	Blue Forester	<i>Lethe scanda</i> Moore, 1857	June	2,000–2,500	4
37	Dull Forester	<i>Lethe gulnihal gulnihal</i> Nicéville, 1887	November	517	1
38	Pallid Forester	<i>Lethe satyavati</i> de Niceville, 1880	March	165	1
39	Salmon-branded Bushbrown	<i>Mycalesis misenus misenus</i> de Nicéville, 1889	June	1,600–2,100	3
40	Watson's Bushbrown	<i>Mycalesis adamsoni</i> Watson, 1897	June, December	100–1,700	2
41	Chinese Bushbrown	<i>Mycalesis gotama charaka</i> Moore, 1874	August	473	1
42	Plain Bushbrown	<i>Mycalesis malsarida</i> Butler, 1868	March	400–600	4
43	Scarce Evening Brown	<i>Cyllogenes janetae loba</i> S.Y. Lang & H. Huang, 2012	August	1,400–1,500	3
44	Dark Catseye	<i>Zipaetis scylax scylax</i> Hewitson, 1863	March, Aug.–Sept.	200–1,000	3
45	Pallid Argus	<i>Callerebia scanda opima</i> Watkins, 1927	August	1,800–2,200	10+
46	Bright-eyed Argus	<i>Callerebia dibangensis</i> Roy, 2013	August	1,900–2,300	99
47	Doherty's Satyr	<i>Aulocera loha</i> Doherty, 1886	August	2,325	1
48	Chumbi Wall	<i>Chonala masoni</i> Elwes, 1882	August	2,300–2,400	10+
49	Tiger Brown	<i>Orinoma damaris damaris</i> Gray, 1846	May	1,389	1
50	Small Goldenfork	<i>Lethe atkinsonia</i> Hewitson, 1876	August	2,325	1
51	Striped Ringlet	<i>Ragadia crisilda crisilda</i> Hewitson, 1862	Nov.–Dec.	300–500	3+
52	Dusky Diadem	<i>Ethope himachala</i> Moore, 1857	May, Sept.	200–1,700	2
53	Newar Three-ring	<i>Ypthima newara newara</i> Moore, 1874	May, June, August	200–2,500	5+
54	Yellow Owl	<i>Neorina hilda</i> Westwood, 1850	August	1,800–2,000	7
55	Peal's Palmfly	<i>Elymnias peali</i> Wood-Mason, 1883	March, November	200–500	7
56	Blue Striped Palmfly	<i>Elymnias patna patna</i> Westwood, 1851	March, August	200–700	8
57	Spotted Palmfly	<i>Elymnias malelas malelas</i> Hewitson, 1863	November	400–500	2
58	Tiger Palmfly	<i>Elymnias nesaea</i> Linnaeus, 1764	February	230	1
59	Scarce Blue Oakleaf	<i>Kallima knyvettii</i> de Nicéville, 1886	August	2,039	1
60	Wizard	<i>Rhinopalpa polynice birmana</i> Frühstorfer, 1897	Sept., Nov.–Dec.	100–500	20+
61	Dot-dash Sergeant	<i>Athyma kanwa phorkys</i> Frühstorfer, 1912	March, June, Dec.	200–350	15+
62	Studded Sergeant	<i>Athyma asura asura</i> Moore, 1857	February	1,564	1
63	Unbroken Sergeant	<i>Athyma pravara acutipennis</i> Frühstorfer, 1906	March, Dec.	250–350	19
64	Bhutan Sergeant	<i>Athyma jina jina</i> Moore, 1857	July	786	1
65	Tytler's Sergeant	<i>Athyma whitei</i> Tytler, 1940	August	648	1
66	Perak Lascar	<i>Pantoporia paraka paraka</i> Butler, 1877	September	137	1
67	Yellow Sailer	<i>Neptis ananta ochracea</i> Evans, 1924	March, Aug., Nov.	300–900	4
68	Great Yellow Sailer	<i>Neptis radha radha</i> Moore, 1857	June, Aug., Dec	100–1,800	3
69	Spotted Sailer	<i>Neptis magadha khasiana</i> Moore, 1872	March, Aug., Sept., Dec.	100–600	10+
70	Great Hockeystick Sailer	<i>Phaedyma aspasia aspasia</i> Leech, 1890	June	759	2
71	Bronze Duke	<i>Euthalia nara nara</i> Moore, 1859	July–August	1,000–1,800	2
72	Green Duke	<i>Euthalia sahadeva sahadeva</i> Moore, 1859	August	1,500–1,800	2

**Table 1:** List of Rare and uncommon butterflies recorded in Arunachal Pradesh, India  
(Dec’ 2011–Dec’ 2014, 3-5 June 2015 and 18 March 2016) (*Contd.*)

Sl. No.	Common Name	Scientific Name	Flight Period (Month/s)	Recorded altitude(m)	Number of individuals recorded
73(a)	French Duke	<i>Euthalia franciae franciae</i> Gray, 1846	March, August	400–800	3
73(b)	French Duke	<i>Euthalia franciae raja</i> Felder & Felder, 1859	August	1,400–2,300	7
74	Grey Baron	<i>Euthalia anosia anosia</i> Moore, 1857	September	137	1
75	Dark Archduke	<i>Lexias dirtea khasiana</i> Swinhoe, 1893	March, Sept., Dec.	300–450	20+
76	Sordid Emperor	<i>Chitoria sordida sordida</i> Moore, 1865	August	344	1
77	Brown Prince	<i>Rohana parvata parvata</i> Moore, 1857	July	325	1
78	Eastern Courtier	<i>Sephisa chandra chandra</i> Moore, 1857	August	1,400–1,600	4
79	White Commodore	<i>Parasarpa dudu dudu</i> Westwood, 1850	March, Jul.–Aug.	400–1,800	3
80	Commodore	<i>Auzakia danava danava</i> Moore, 1857	February, August	600–800	2
81	Grey Commodore	<i>Bhagadatta austenia austenia</i> Moore, 1872	June, August	600–2,300	5+
82	Empress	<i>Sasakia funebris funebris</i> Leech, 1891	August	1,706	1
83	Panther	<i>Neurosigma siva siva</i> Westwood, 1850	September	1,520	1
84	Constable	<i>Dichorragia nesimachus nesimachus</i> Doyère, 1840	Aug.–Sept.	100–1,800	5
85	Yellow Kaiser	<i>Penthema lisarda lisarda</i> Doubleday, 1845	August	300–800	5
86	Red Caliph	<i>Enispe euthymius euthymius</i> Doubleday, 1845	March, Nov.	300–500	2
87	Jungle Glory	<i>Thaumantis diores diores</i> Doubleday, 1845	November	300–450	7
88	Manipur Jungle Queen	<i>Stichophthalma sparta tytleri</i> Rothchild, 1918	August	1,600–1,800	8
89	Northern Jungle Queen	<i>Stichophthalma camadeva nicevillei</i> Röber, 1900	August	1,600–1,800	3
90	Great Duffer	<i>Discophora timora timora</i> Westwood, 1850	September	100–200	1
91	Tiger-mimic Admiral	<i>Limenitis rileyi</i> Tytler, 1940	August	1,660	1
<b>HESPERIIDAE</b>					
92(a)	Slate Awl	<i>Hasora anura anura</i> de Nicéville, 1889	June	1,270	1
92(b)	Slate Awl	<i>Hasora anura china</i> Evans, 1949	August	2,000–2,100	3
93	Pale Green Awlet	<i>Burara gomata gomata</i> Moore, 1865	June	1,267	1
94	Small Green Awlet	<i>Burara amara</i> Moore, 1865	Aug.–Sept.	200–1,650	4
95	Hooked Awlking	<i>Choaspes furcata</i> Evans, 1932	June	1,267	1
96	Wax Dart	<i>Cupitha purreea purreea</i> Moore, 1877	December	186	1
97	Greenish Palm Dart	<i>Telicota ancilla horisha</i> Evans, 1934	August	1,554	1
98	Himalayan Yellow-banded Flat	<i>Celaenorrhinus dhanada</i> Moore, 1865	March, Nov.	300–550	2
99	Dark Yellow-banded Flat	<i>Celaenorrhinus aurivittata aurivittata</i> Moore, 1878	May, August	200–1,600	2
100	Tytler’s Multi-spotted Flat	<i>Celaenorrhinus ratna tytleri</i> Evans, 1926	August	1,554	2
101	DuskyYellow-breasted Flat	<i>Gerosis phisara phisara</i> Moore, 1884	May, Aug., Sept., Dec.	200–1,300	4
102	Yellow Flat	<i>Mooreana trichoneura pralaya</i> Moore, 1865	August	550	1
103	Northern Spotted Ace	<i>Thoressa cerata</i> Hewitson, 1876	June	168	1
104	Luca’s Ace	<i>Sovia lucasii</i> (Mabille, 1876)	July, August	1,500–1,600	2
105	Long Banded Ace	<i>Halpe zola</i> Evans, 1937	September	137	1
106	Light Straw Ace	<i>Pithauria stramineipennis</i> Wood-Mason & de Nicéville, 1886	Aug.–Sept.	100–900	2
107	Forest Bob	<i>Scobura isota</i> Swinhoe, 1893	March, Dec.	300–400	2
108	Spotted Red-eye	<i>Pudicitia pholus</i> de Nicéville, 1889	June	2,097	1
109	Yellow-fringed Swift	<i>Caltoris aurociliata</i> Elwes & Edwards, 1897	November	136	1

are kept in NFIC. 'Rare' from Sikkim to Assam (Evans 1932). Active flier in June, July, and October in Naga hills and at low elevations in the Sikkim Darjeeling area (Wynter-Blyth 1957). Single record from Tholung valley in Sikkim feeding on flowers of *Fragaria* sp. (Haribal 1992). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014).

#### 10. Pale Jezebel *Delias sanaca bhutya* Talbot, 1937

**Status:** Schedule I, Part IV (IWPA 1972).

**Specimens sighted:** 5+ individuals.

**Locality and Date of sighting:** One individual recorded on 03.ix.2012 at 1,228 m at Tato, Upper Subansiri and a small congregation (4+) recorded on wet sand on 30.vii.2013 at 2,284 m near Lama Camp in Eaglenest Wildlife Sanctuary, West Kameng district.

**Notes:** The subspecies *bhutya* is known from Bhutan (1,800–2,800 m) (Mani 1986) and recorded from Trashiyangtse valley, eastern Bhutan in Tarpel at 2,230 m, and Trashiyangste town at 1,600 m in August and October (Wangdi *et al.* 2012). The species *Delias sanaca* is distributed from Jammu & Kashmir to Myanmar (Kehimkar 2008).

#### Lycaenidae

#### 11. Hooked Oakblue *Arhopala paramuta paramuta* de Nicéville, 1883

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** Recorded in semi-evergreen forest in Deomali, Tirap district at 175 m on 04.ix.2011.

**Notes:** Specimens from Cachar hills (♂: 17.x.1907, ♀: 12.x.1907) collected by O.C. Ollenbach are kept in NFIC. Recorded as a 'rare' subspecies at low elevations in Manipur from February to April, one collected from Imphal in July (Tytler 1915). Distributed from Sikkim to Myanmar and recorded as 'not rare' (Evans 1932); also recorded from Assam (Wynter-Blyth 1957). Common across Nepal (Kashi district) from the Terai up to 1,500 m during January–June, September–December (Smith 1989). Also recorded from Jeypore–Dehing Forest, eastern Assam (Gogoi 2013 a) and Gibbon Wildlife Sanctuary near Jorhat, Assam in March–April (Singh *et al.* 2015). Recently recorded at 28–110 m in February–March in Barail WLS, Cachar hills, southern Assam (Gogoi *et al.* 2016).

#### 12. Green Oak Blue *Arhopala eumolphus eumolphus* Cramer, 1780

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** 11 individuals.

**Locality and Date of sighting:** Locally common in Pakke

Tiger Reserve between 126–186 m, recorded on 04.ii.2013 (8 nos; both sexes), 07.iii.2013 (2 nos) and 18.xii.2013 (1 no.). **Notes:** Specimens from Sikkim (♂: 10.x.1922, ♀: 12.x.1922) collected by O.C. Ollenbach are kept in NFIC. Recorded from Imphal, Sebong, and Cachar road in Manipur from November to April (Tytler 1915). Distributed in Nepal, Sikkim, and Assam and recorded as 'not rare' (Evans 1932). Uncommon in East-Central Nepal (Kashi district) from the Terai to 1,700 m during January, April, May, October, and December (Smith 1989). Recorded at low altitudes in Sikkim in October–November (Haribal 1992). Also recorded from Jeypore–Dehing Forest, eastern Assam (Gogoi 2013a). Singh and Chib (2014) recorded it from Mendrelgang, Tsirang district, Bhutan. Found in Gibbon Wildlife Sanctuary near Jorhat, Assam in March–April (Singh *et al.* 2015). Recently recorded between 28 and 110 m from December–March in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

#### 13. Sylhet Oakblue *Arhopala silhetensis silhetensis* Hewitson, 1862

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens sighted:** 10+ individuals.

**Locality and Date of sighting:** A few individuals recorded in Pakke Tiger Reserve, West Kameng at 186 m, 18–19.xii.2013.

**Notes:** Specimens from Sikkim (♂: 23.viii.1909, ♀: 24.ix.1919) collected by O.C. Ollenbach are kept in NFIC. Recorded in October–November in Naga Hills, and March–April in Sebong, Manipur Hills (Tytler 1915). Distributed from Sikkim to N. Myanmar and considered 'rare' (Evans 1932), and in Assam (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Also recorded from Jeypore–Dehing Forest, eastern Assam (Gogoi 2013a) and Gibbon Wildlife Sanctuary near Jorhat, Assam from January to May (Singh *et al.* 2015). Recorded from Pakke Tiger Reserve in April, May, and September (Sondhi and Kunte 2014). Recently recorded at 28 m from February–May in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

#### 14. Glazed Oakblue *Arhopala paralela* Evans, 1925

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** Single record near Mpen in Namdapha Tiger Reserve, Changlang district at 401 m on 28.xi.2013.

**Notes:** 'Rare' from Manipur to Shan States in Myanmar (Evans 1932).

#### 15. Pale Spark *Sinthusia virgo* Elwes, 1887

**Status:** Schedule I, Part IV (IWPA 1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** Single record at 2,057 m in Dibang valley on 06.vi.2014, on way to Mayodia pass from Roing.

**Notes:** Recorded from Kirbari, Naga Hills in June (Tytler 1915). ‘Very Rare’ from Sikkim to Manipur, and Bernardmayo in central Myanmar (Evans 1932). Recorded in Darjeeling hills between 1,950 and 2,400 m in June (Wynter-Blyth 1957).

**16. Shot Flash *Rapala rectivitta* Moore, 1879**

**Status:** Not listed in IWPA (1972).

**Specimens sighted:** One individual.

**Locality and Date of sighting:** Recorded from Hunli in Upper Dibang valley at 580 m on 07.vi.2014.

**Notes:** Specimen collected from Jakhama, Naga Hills (♂: 21.viii.1924) by O.C. Ollenbach is kept in NFIC. A rare species found from Sikkim to Assam (Evans 1932; Wynter-Blyth 1957). ‘Not Rare’ across Nepal from Terai to 2,000 m from February–June (Smith 1989).

**17. Brilliant Flash *Rapala sphinx sphinx* Fabricius, 1775**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens recorded:** One individual photographed.

**Locality and Date of sighting:** Recorded at 201 m on 18.xii.2013 in Pakke Tiger Reserve, West Kameng.

**Notes:** Specimen from Khasi Hills collected in June 1916 by O.C. Ollenbach is kept in NFIC. Recorded in March, April, and October in Nichuguard, Naga Hills (Tytler 1915). Distributed from Assam to Rangoon, Myanmar and recorded as rare (Evans 1932; Wynter-Blyth 1957).

**18. Blue Imperial *Ticherra acte acte* Moore, 1889**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Eleven individuals.

**Locality and Date of sighting:** Recorded in Pakke Tiger Reserve between 126 and 186 m on 03.iv.2013 (2♂, 1♀) and 08.xii.2013 (1♂).

**Notes:** Recorded from Irangamara in Cachar hills in July (Wood-Mason and de Nicéville 1886). Specimens from Cachar Hills (♂: 04.v.1907) and Pagaye, Tavoy, Myanmar (♀: 21.ix.1914) collected by O.C. Ollenbach are kept in NFIC. Recorded as ‘not rare’ from Kumaon to Myanmar (Evans 1932) including Assam, recorded from spring to autumn (Wynter-Blyth 1957). ‘Rare’ in east-central Nepal (Kashi district) from 240 m to 930 m during February, April, July, September, and December (Smith 1989). A specimen collected in rainy season from Tumin in Sikkim (Haribal 1992). Recorded by Borang *et al.* (2008) in Dihang-Dibang Biosphere Reserve and by Gogoi (2012) along Deopani riverbed below 1,000 m near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh. Recorded from Jeypore-

Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in May (Sondhi *et al.* 2013). Singh and Chib (2014) recorded it from Mendrelgang, Tsirang district, Bhutan. Recorded from Pakke Tiger Reserve in April, June, and September (Sondhi and Kunte 2014). Recently recorded between 28 and 300 m from January–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**19. Straight Pierrot *Caleta roxus roxana* de Nicéville, 1897**

**Status:** Not listed in IWPA (1972)

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Sightings from Deomali (127 m; 14.ix.2014) in Tirap district, Kamlang Wildlife Sanctuary (320 m; 05.viii.2014), and Wakro (458 m; 06.viii.2014) near Parshuram Kund in Lohit district.

**Notes:** A specimen from Cachar Hills (♂: 27.iv.1910) collected by O.C. Ollenbach is kept in NFIC. Recorded from eastern and western Manipur hills and Nichuguard in Naga Hills in February–April and November–December (Tytler 1915). ‘Not rare’ from Assam to N. Myanmar (Evans 1932). A forest butterfly common in Naga Hills and Manipur (Wynter-Blyth 1957). Recorded from Pakke Tiger Reserve in May (Sondhi and Kunte 2014).

**20. Forest Pierrot *Taraka hamada mendesia* Frühstorfer, 1918**

**Status:** Not listed in IWPA (1972)

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record from Jairampur in Changlang district at 479 m on 06.xi.2014.

**Notes:** Recorded from eastern Terai in Jhapa district of Nepal (Smith 1989). ‘Not rare’ from Sikkim to Myanmar (Evans 1932). Recorded during October in Orang Wildlife Sanctuary, Assam (Basistha *et al.* 1999). Recorded from Garo Hills in April (Sondhi *et al.* 2013). Recorded from Pakke Tiger Reserve in April, May, and September (Sondhi and Kunte 2014). Recently recorded between 28 and 110 m in December–February in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**21. Dark Pierrot *Tarucus ananda* de Nicéville, 1883**

**Status:** Schedule IV (IWPA 1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record at 480 m near Daporijo, Upper Subansiri on 12.viii.2012 mud-puddling on wet road amongst other lycaenids inside the forest.

**Notes:** ‘Not rare’ across southern India up to Maharashtra, Sikkim to Dawnas, Myanmar (Evans 1932; Wynter-Blyth 1957). Local in lower midlands of east and central Nepal (Nawalparasi district) from Terai up to 660 m in March,

April, July, October, and November (Smith 1989). Recorded from Garo Hills in May (Sondhi *et al.* 2013) and Pakke Tiger Reserve in March, May, and October (Sondhi and Kunte 2014). Recently recorded between 28 and 110 m in December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**22. Branded Yamfly *Yasoda tripunctata tripunctata* Hewitson, 1863**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens recorded:** Eight individuals.

**Locality and Date of sighting:** Recorded in Pakke on 18–19. xii.2013 at 141 m, Namdapha on 06.ii.2013 and 14.xii.2012, and near Etalin, Upper Dibang valley on 30.viii.2013 at 770 m.

**Notes:** Specimens from Sikkim (♂: 14.v.1919) and (♀: September 1919) collected by O.C. Ollenbach are kept in NFIC. Recorded from Silcuri and surrounding forests in Cachar hills in May–July (Wood-Mason and de Nicéville 1886). Not common in Manipur (Tytler 1915). Rare, found from Sikkim to Myanmar (Evans 1932) including Assam, while it is ‘not rare’ in Manipur and Naga Hills at low elevations (Wynter-Blyth 1957). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in May (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in May (Sondhi and Kunte 2014) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in October (Singh *et al.* 2015).

**23. Blue Quaker *Pithecopis fulgens fulgens* Doherty, 1889**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record at 28.xi.2013 in Namdapha Tiger Reserve, Changlang district in evergreen forest at 428 m.

**Notes:** Recorded from Irang and Lengba rivers in Western Manipur hills in March, April, October, and November and from Margherita in Upper Assam (Tytler 1915). Rare, in Assam (Evans 1932; Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Borang *et al.* (2008) in Dihang-Dibang Biosphere Reserve. Also, recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a).

**24. Burmese Sunbeam *Curetis saronis gloriosa* Moore, 1883**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record of a female (with

orange discal areas) at 147 m from Namdapha Tiger Reserve, Changlang district on 20.iii.2013, basking low on shrubs.

**Notes:** A similar specimen from Tenasserim, Myanmar (♀: 12.iv.1920) collected by O.C. Ollenbach kept in NFIC. Commonly recorded from Silcuri and surrounding forests in Cachar Hills in May–August (Wood-Mason and de Nicéville 1886). Recorded from Sylhet (Bangladesh) to Myanmar (Evans 1932; Wynter-Blyth 1957). Recently recorded at 46 m in January in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**25. Great Spotted Blue *Phengaris atroguttata* Oberthür, 1876**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Five individuals.

**Locality and Date of sighting:** Locally common. Recorded at 1,440 m on the forest edge near Dambuine in upper Dibang valley (12.ix.2013).

**Notes:** Specimens from Naga Hills (♂: 19.x.1913 at 2,100 m, ♀: 11.x.1924) collected by O.C. Ollenbach are kept in NFIC. Rare species found in Naga and Chin Hills (Myanmar) at 2,100 m in September (Evans 1932; Tytler 1915; Wynter-Blyth 1957).

**26. Moore’s Cupid *Shijimia moorei moorei* Leech, 1889**

**Status:** Schedule I, Part I, IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** First record from Daporijo in Upper Subansiri (413 m) on 28.viii.2012 and the second adjoining Kamlang Wildlife Sanctuary-Wakro (358 m) in Lohit district on 05.viii.2014.

**Notes:** ‘Very rare’, found in Assam (Evans 1932; Wynter-Blyth 1957). Recorded from Ultapani block in Ripu-Chirang Wildlife Sanctuary, Assam (Choudhury 2010).

**27. Straightwing Blue *Orthomiella pontis pontis* Elwes, 1887**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Three individuals were recorded on wet mud on the roadside on 15.iii.2014 at 1,298 m below Mayodia Pass towards Hunli in Dibang valley.

**Notes:** Specimens from Jakhama, Naga Hills (♂: 06.iv.1924 and ♀: 07.v.1924 at 1,620 m) collected by O.C. Ollenbach are kept in NFIC. Recorded from March to June in Manipur Hills between 1,200 and 2,800 m (Tytler 1915). Rare from Sikkim to Northeast and Myanmar (Evans 1932), including Assam. Found in dense forest between 900 m and 1,800 m during March–June, very local and rare in Sikkim and Naga Hills and mostly located on moist patches on

wooden bridges beside mountain torrents in Teesta valley (Wynter-Blyth 1957). ‘Rare’ in Eastern Midlands of Nepal (Ilam and Panchthar districts) from 1,950–2,000 m during April (Smith 1989). Also recorded by the author on the road on wet sand in Bunakha, western Bhutan on the way to Thimphu from Phuntsholing during April 2010 (Singh 2016).

**28. Pointed Lineblue *Lonolyce helicon merguiana* Moore, 1884**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded from Tippi (231 m), West Kameng on 15.vii.2012 on wet sand on the road.

**Notes:** Distributed from Sikkim to Myanmar, recorded as ‘not rare’ (Evans 1932). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Pakke Tiger Reserve in May, June, and September (Sondhi and Kunte 2014) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in July–August (Singh *et al.* 2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**29. Banded Lineblue *Prosotus aluta coelestis* Wood-Mason & de Nicéville, 1886**

**Status:** Schedule II, Part II (IWPA 1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Recorded from entrance gate of Kamlang Wildlife Sanctuary, Lohit district on 05.viii.2014 at 458 m on wet ground (2 nos) and at Deomali, Tirap district on 14.ix.2014 at 137 m.

**Notes:** Rare from Kumaon to Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Flies up to 300 m in July, September, and October (Kehimkar 2008). Recorded along the Sankosh river in lowland forests of Bhutan adjoining Buxa Tiger Reserve in winter (Singh 2012). Gogoi (2012) found it along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m and from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in March–May and October–December (Sondhi *et al.* 2013), from Pakke Tiger Reserve in March–June, and October (Sondhi and Kunte 2014), and from Gibbon Wildlife Sanctuary, near Jorhat, Assam in September–October (Singh *et al.* 2015).

**30. White-banded Hedge Blue *Lestranicus transpectus* Moore, 1879**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded from Namdapha Tiger Reserve, Changlang district at 357 m on 27.xi.2013 and near Seppa, East Kameng district on 13.xii.2014 at 1,251 m.

**Notes:** Specimens from Sikkim (♂: 25.vi.1919, ♀: 06.xi.1922) collected by O.C. Ollenbach are kept in NFIC. ‘Not rare’ and distributed from Sikkim to Myanmar (Evans 1932) including Assam; ‘common’ in Sikkim at 1,200 m from March to May and then again from September to November. ‘Rare’ in Naga Hills in May and again from August to October, Khasi Hills in September, and Manipur in November (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in May (Sondhi *et al.* 2013). Recorded from Pakke Tiger Reserve in March–May and September–October (Sondhi and Kunte 2014). Recently recorded between 28 and 110 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**31. Glistening Cerulean *Jamides elpis pseudelpis* Butler, 1879**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** One record from Wakroo in Kamlang WLS (358 m) on 05.viii.2014.

**Notes:** Specimens from Sikkim (♂: 17.v.1916) and Tenasserim, Myanmar (♀: 12.xii.1919) collected by O.C. Ollenbach are kept in NFIC. Recorded as not rare and distributed from Sikkim to Myanmar and Andamans (Evans 1932) including Assam, and fairly common at low elevations in Sikkim-Darjeeling area (Wynter-Blyth 1957). Was observed as common during October in Orang Wildlife Sanctuary, Assam (Basistha *et al.* 1999). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills in May (Sondhi *et al.* 2013) and Pakke Tiger Reserve in March–June (Sondhi and Kunte 2014). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

## Nymphalidae

**32. Jewelled Nawab *Charaxes delphis delphis* Doubleday, 1843**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record of one individual on wet ground among mud-puddling congregation of butterflies in an evergreen forest near Deomali, Tirap district on 14.ix.2014 at 137 m.

**Notes:** Recorded from Silcuri in Cachar Hills, Assam in August (Wood-Mason 1886). A specimen from Pagaye, Tavoy, Myanmar (♂: 17.xi.1923) collected by O.C. Ollenbach is kept in NFIC. The species *Charaxes delphis* was recorded as 'not rare' from Assam to Myanmar (Evans 1932). Recorded from Naga Hills and Cachar in August and November and most abundant in Myanmar (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded from Garo Hills in April (Sondhi *et al.* 2013). Specimen collected in May from Debbari in Gomti district, Tripura at 48 m in semi-evergreen forest (Lodh and Agarwala 2015).

### 33. Malayan Nawab *Charaxes moori sandakanus* Frühstorfer, 1883

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record along a stream between Haylung and Chaguin on way to Walong, Anjaw district on 07.viii.2014 at c. 700 m.

**Notes:** Recorded as 'very rare' from Sikkim-Myanmar (Evans 1932) through Assam (Wynter-Blyth 1957). Subspecies *sandakanus* is considered 'very rare' and occurs from Sikkim to Arunachal Pradesh (Dafla Hills), N.E. India (Garo and Khasi Hills, and Nagaland), and Myanmar (Gasse 2013). Recorded at Gongrot in Garo Hills in May-June (Sondhi *et al.* 2013).

### 34. Tailed Red Forester *Lethe sinorix sinorix* Hewitson, 1863

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Nine individuals.

**Locality and Date of sighting:** Recorded from Namdapha Tiger Reserve (12-14.xii.2012; 20.iii.2013; 27-28.xi.2013; 06.xi.2014) Tippi, West Kameng (11.xii.2014 at 195 m) and Seppa, East Kameng (12.xii.2014 at 644 m).

**Notes:** Specimens from Khasi Hills (♂: 16.iv.1907) and Tenasserim, Myanmar (♀: 03.iv.1904) collected by O.C. Ollenbach are kept in NFIC. One male specimen collected from Arunachal Pradesh (Evans 1914). The species *Lethe sinorix* occurs from Sikkim to Dawnas (S. Myanmar) and was recorded as rare (Evans 1932), including Assam from July to September and recorded above 900 m in June in Sikkim (Wynter-Blyth 1957). Betts (1950) recorded it during August at Pite in Subansiri area at 600 m in a bamboo forest. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Collected from Lachen-Lachung valley in Sikkim and Darjeeling area (Haribal 1992). The species *Lethe sinorix* has been recorded as 'uncommon' in forest clearings, on flowers and hill tops between 1,500 and

2,000 m in Bhutan (van der Poel and Wangchuk 2007). 'Rare' in central Nepal (Kaski and Kathmandu) between 1,500 and 2,160 m in April, July, September to November. Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a).

### 35. Scarce Red Forester *Lethe distans* Butler, 1870

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** One record from Namdapha Tiger Reserve at 381 m on wet sand, on 20.iii.2013.

**Notes:** One dry season male specimen collected from Arunachal Pradesh (Evans 1914). Recorded as 'very rare' from Sikkim to Karen in Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988).

### 36. Blue Forester *Lethe scanda* Moore, 1857

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Four individuals.

**Locality and Date of sighting:** Observed on 06.vi.2014 and 10.vi.2014 below Mayodia pass in Dibang valley at 2,059 m and 2,424 m on roadside rocks along bamboo brakes.

**Notes:** One specimen collected from Arunachal Pradesh (Evans 1914). A specimen from Tendong, Sikkim (♂: September 1921) collected by O.C. Ollenbach is kept in NFIC. Recorded as 'rare' from Sikkim to Assam (Evans 1932). Betts (1950) recorded it in Subansiri area during October at Tasser Puttu at 1,350 m and in August at Pite at 600 m in a bamboo forest. Recorded during May and June in Neora Valley National Park, West Bengal (Sengupta *et al.* 2014). Flies between 900 and 2,700 m in June, August, and September (Wynter-Blyth 1957). 'Rare' in forested areas between 1,500 and 2,500 m in Bhutan (van der Poel and Wangchuk 2007).

### 37. Dull Forester *Lethe gulnihal gulnihal* de Nicéville, 1887

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record from Namdapha Tiger Reserve on 27.xi.2013 at 517 m, on a road along the forest with bamboo brakes and canes.

**Notes:** One male specimen collected from Arunachal Pradesh (Evans 1914). Specimens from Karen Hills (♂: 07.xi.1920) and Kachin (♂: May 1894), Myanmar collected by O.C. Ollenbach are kept in NFIC. Recorded as 'very rare' from Bhutan to N. Myanmar (Evans 1932) including Assam (Wynter-Blyth 1957). Recorded by Gogoi (2012) along the Deopani riverbed

near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m.

**38. Pallid Forester *Lethe satyavati* de Nicéville, 1880**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record from bamboo thickets at Jairampur (165 m), Changlang district (Arunachal Pradesh) bordering Lekhpani (Assam) on 18.iii.2016.

**Notes:** Recorded as ‘very rare’ in Assam (Evans 1932). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a).

**39. Salmon-branded Bushbrown *Mycalesis misenus misenus* de Nicéville, 1889**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** First recorded from a grassy patch between Anini and Mippi, in Dibang valley, Arunachal Pradesh, where two individuals were photographed on 08.vi.2014 at 1,674 m, while second sighting was below Mayodia Pass on 10.vi.2014 at 2,024 m, also in Dibang valley.

**Notes:** One male specimen collected from Lower Tsan Po, Dibang valley in June at 900 m (Evans 1914). ‘Rare’ from Sikkim to Assam at low elevations (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, below 1,000 m.

**40. Watson’s Bushbrown *Mycalesis adamsoni* Watson, 1897**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded from Dibang valley at 1,648 m on 10.vi.2014 and in Pakke Tiger Reserve at 183 m on 18.xii.2013.

**Notes:** Specimens from Manipur (♂: 19.vi.1912) and Shan states, Myanmar (♀: 16.iv.1914) collected by O.C. Ollenbach are kept in NFIC. Recorded as ‘rare’ and distributed in Manipur and Northern Myanmar (Evans 1932). Flies during March, April, June, and November in Manipur (Wynter-Blyth 1957). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a).

**41. Chinese Bushbrown *Mycalesis gotama charaka* Moore, 1874**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** One individual recorded at 473 m between Roing and Tiwari Gaon in Dibang valley district on 14.viii.2012.

**Notes:** Specimens from Jakhama, Naga Hills (♂: 03.vi.1926, ♀: 24.iv.1924) between 1,600 and 1,650 m collected by O.C. Ollenbach are kept in NFIC. Recorded as ‘rare’ from Assam to Myanmar (Evans 1932) and N.E. Himalaya (Wynter-Blyth 1957). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Pakke Tiger Reserve in April (Sondhi and Kunte 2014). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in January–April (Singh *et al.* 2015).

**42. Plain Bushbrown *Mycalesis malsarida* Butler, 1868**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Four individuals.

**Locality and Date of sighting:** Three individuals recorded between 473–510 m in Namdapha Tiger Reserve on 19.iii.2013. Fourth individual recorded in Jairampur Reserve Forest (165 m), Changlang district bordering Assam on 18.iii.2016.

**Notes:** Specimens from Khasi Hills (one ♂: June 1915, one ♀: 27.vii.1910) collected by O.C. Ollenbach are kept in NFIC. Recorded as ‘rare’ and found in Assam (Evans 1932; Wynter-Blyth 1957). Reported as ‘not rare’ and ‘seems rare’ from the Khasi Hills (Parsons and Cantlie 1948). Betts (1950) recorded it in July at Dejoo (90 m), Lichi (900 m) in the interior of evergreen forest, and once at Duta (600 m) in open cultivation, all in Subansiri area. Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills at low elevations up to 1,200 m from March–May, November and December (Sondhi *et al.* 2013), and from Pakke Tiger Reserve in May, September, and October (Sondhi and Kunte 2014). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in January–April (Singh *et al.* 2015). Seven specimens collected in November 2009 from evergreen forests in Taidang and Jidung streams near Gongrot and at Karwani stream in Baghmara RF, South district, Tripura by Lodh and Agarwala (2015). Recently recorded between 28–1,000 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**43. Scarce Evening Brown *Cyllogenes janetae loba* S. Y. Lang & H. Haung, 2012**

**Status:** Not yet given, since this is the only record of this subspecies from India.

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** On 11.viii.2012 at Awapani mill area between Anini and Dambunie in Upper Dibang valley, Arunachal Pradesh at 1,440 m.

**Notes:** Rare. A recently described subspecies by Lang and Huang (2012) from Medog area, S.E. Tibet in China bordering the Upper Dibang valley district of Arunachal Pradesh, India. The holotype was collected by Lang on 12.viii.2012 at 2,000 m. Coincidentally, the present author also found and photographed *C. j. loba* on 11.viii.2012, a day before Lang at Awapani, near Dambunie, not far from the holotype locality across the border in China. This is the first record of the subspecies from India.

#### 44. Dark Catseye *Zipaetis scylax scylax* Hewitson, 1863

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Recorded in Namdapha on 20.iii.2013 at 398 m; second record between Hapoli and Daporijo, Subansiri district on 28.viii.2013 at 940 m; third record from Borduria range near Deomali in Tirap district on 11.ix.2014 at 290 m.

**Notes:** Two males recorded in lower Tsang Po, Dibang valley at 900 m in June (Evans 1914). Specimens from Tendong, Sikkim (♂: 14.vi.1919) and Chhindwin, Myanmar (♀: 15.iv.1896) collected by O.C. Ollenbach are kept in NFIC. Recorded as 'not rare' from Sikkim to Shan states in Myanmar (Evans 1932) including Assam. Recorded during April–May but present throughout the year at low and moderate elevations (Wynter-Blyth 1957). Betts (1950) recorded it during May and September at Tasser Pttu (1,050 m) and Pite (600 m) in Subansiri area in undergrowth of evergreen and bamboo forest. A skulking butterfly of lower elevations, recorded in March and June from Darjeeling and the Teesta valley, Sikkim (Haribal 1992). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Borang *et al.* (2008) between 900 and 1,600 m as rare, during October–November in Dihang Dibang Biosphere Reserve, and by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Pakke Tiger Reserve in March–October (Sondhi and Kunte 2014). Recently recorded at 100 m in March in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

#### 45. Pallid Argus *Callerebia scanda opima* Watkins, 1927

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 10+ individuals.

**Locality and Date of sighting:** Many individuals were recorded at Mayodia pass (~2,200 m) in lower Dibang valley and two inside Eaglesnest Wildlife Sanctuary (~2,000 m) and

one in Shergaon (1,800 m) in West Kameng district during the monsoon season (29–31.viii.2013).

**Notes:** This subspecies *opima* was previously known as 'rare' in Lachung, upper Sikkim (Evans 1932). Common across Nepal from 1,830–2,800 m from July–September (Smith 1989). Recorded as 'fairly common' along roadsides and forest trails between 1,900 and 2,800 m in Bhutan (van der Poel and Wangchuk 2007).

#### 46. Bright-eyed Argus *Callerebia dibangensis* Roy, 2013

**Status:** Not yet given.

**Specimens recorded:** 99 individuals.

**Locality and Date of sighting:** Locally common. Many individuals recorded near Mayodia Pass, Dibang valley on 09.viii.2012 (6 nos) and 29–31.viii.2013 (93 individuals of both sexes) between c. 1,900 and 2,300 m. Courtship and mating, wing morphology of female specimens, ecology, and male genitalia of this species were described by Singh (2015). **Notes:** Previously known from only one male specimen collected from Mithun valley in upper Dibang valley district (exact location unknown) at 1,830 m on 14.vii.1987, but altitudinal distribution range given is 1,600–1,800 m (Roy 2013).

#### 47. Doherty's Satyr *Aulocera loha* Doherty, 1886

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** One individual recorded on 09.viii.2012 at 2,325 m in Mayodia Pass in Dibang valley on a rocky patch with grass.

**Notes:** Thirteen males at 1,800–2,400 m in October–November between Tawang and Kyeri near Bhutan border (Evans 1914). Specimens from Naga Hills (♂: 07.viii.1926) and Chhindwin, Myanmar (♀: 30.ix.1924), between 1,800 and 2,000 m, collected by O.C. Ollenbach are kept at NFIC. Distributed from Kumaon to Assam up to 2,400 m and recorded as not rare (Evans 1932). Betts (1950) recorded it during September in Momba country between 1,800 and 3,000 m. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). 'Rare' in East and Central Nepal (Kathmandu and Rasuwa districts) from 2,700–3,900 m from July–September (Smith 1989).

#### 48. Chumbi Wall *Chonala masoni* Elwes, 1882

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** 10+ individuals.

**Locality and Date of sighting:** All observed in flight. One caught and released after identification on 09.viii.2012 at 2,325 m near Mayodia Pass in an open rocky patch with grass.

**Notes:** Specimens from Sikkim (♂: 07.ix.1922,

♀: 21.vi.1919) collected by O.C. Ollenbach are kept in NFIC. Recorded as 'not rare' and distributed from Sikkim to Assam (Evans 1932). Common in Upper Teesta valley in Sikkim (Haribal 1992). Recorded below Dochula pass (~2,000 m) near Thimpu in Bhutan by the author.

**49. Tiger Brown *Orinoma damaris damaris* Gray, 1846**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record at 1,389 m near Mengio towards Yazuli, in lower Subansiri on 16.v.2012.

**Notes:** Specimens from Khasi Hills (♂: 25.v.1904) and Naga Hills at 1,650 m (♀: 20.x.1925) collected by O.C. Ollenbach are kept in NFIC. Distributed from Kangra (Himachal Pradesh) to Karen (Myanmar) and recorded as 'not rare' (Evans 1932). Recorded as local and rare between 1,300 and 2,000 m including Assam (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). 'Not rare' in central upper Midlands of Nepal (Kashki and Kathmandu), from 900–1,850 m, in May, June, and September to November (Smith 1989).

**50. Small Goldenfork *Lethe atkinsonia* Hewitson, 1876**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record below Mayodia Pass on 14.viii.2012 in bamboo brakes at 2,325 m.

**Notes:** Specimens from Sikkim (♂: 27.ix.1917) collected by O.C. Ollenbach kept in NFIC. Recorded as rare from Sikkim to Bhutan (Evans 1932). One specimen collected from Lachen in Sikkim (Haribal 1992). 'Very rare' with only one record from Nepal (recorded at 2,732 m) in August (Smith 1989). Two individuals recorded between 3,000 and 4,300 m at Mongar and Thimphu in Bhutan (Sbordoni *et al.* 2015).

**51. Striped Ringlet *Ragadia crisilda crisilda* Hewitson, 1862**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 3+ individuals.

**Locality and Date of sighting:** Recorded from Namdapha Tiger Reserve on 12.xii.2012 and 27–29.xi.2013 between 334 and 487 m.

**Notes:** Specimens from Khasi Hills (♂: 01.iii.1905, ♀: 12.vii.1908) collected by O.C. Ollenbach are kept in NFIC. Recorded as 'not rare' from Cachar in Assam (Evans 1932), distributed from Bhutan to Manipur up to Myanmar, found in forested areas at lower elevations (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Borang *et al.* (2008) in Dihang-Dibang Biosphere Reserve and by Gogoi (2012) along the

Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Pakke Tiger Reserve in September (Sondhi and Kunte 2014). Recently recorded at 30–700 m from March–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**52. Dusky Diadem *Ethope himachala* Moore, 1857**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** One record from Kamlang Wildlife Sanctuary at 286 m on 04.v.2012 and one between Sanlium and Lazu at 1,635 m in Tirap district on 12.ix.2014. Prefers edges in low elevation semi-evergreen forest.

**Notes:** Specimens from Khasi Hills (♂: 17.xi.1903, ♀: 22.v.1903) collected by O.C. Ollenbach are kept in NFIC. Five specimens collected from Arunachal Pradesh (Evans 1914). 'Not rare' from Sikkim, Assam, and N. Myanmar where it was found along streams in autumn between 900 and 2,100 m (Evans 1932; Wynter-Blyth 1957). Betts (1950) recorded it during April and October at Lichi (900 m) and Pite (600 m) in Subansiri area in undergrowth of bamboo forest. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Prefers thickly forested areas and is common in Arunachal Pradesh where it basks in the morning and after heavy showers with wings open (Haribal 1992). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in March–May and November–December (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in May, June, and October (Sondhi and Kunte 2014). Recently recorded at 30 m from January–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**53. Newar Three-ring *Ypthima newara newara* Moore, 1874**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** 5+ individuals.

**Locality and Date of sighting:** Recorded near Roing in Dibang valley on 08.v.2012 at 202 m; Menchuka in upper Subansiri at 2,465 m on 02.vi.2012; Menjio in lower Subansiri at 1,389 m on 15.v.2012, and in Dambunine, Upper Dibang valley at 1,554 m on 13.viii.2012.

**Notes:** Recorded from Silcuri in Cachar Hills in May and July (Wood-Mason 1886). Not rare from Sikkim to Assam (Evans 1932). Betts (1950) recorded it in September at 'Lih' (2,100 m) in grassland in Momba country in western Arunachal Pradesh. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Common in forest and scrub below 2,000 m in Bhutan (van der Poel and Wangchuk 2007). Singh and

Chib (2014) recorded it from Mendrelgang, Tsirang district, Bhutan. Recorded from Pakke Tiger Reserve in September and October (Sondhi and Kunte 2014).

**54. Yellow Owl *Neorina hilda*** Westwood, 1850

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Seven individuals.

**Locality and Date of sighting:** Six individuals were observed at Mayodia pass in Lower Dibang valley on 09.viii.2012, all sucking minerals from animal dung in the evening at c. 2,000 m. Recorded again on 31.viii.2013 near the same place.

**Notes:** One male specimen collected near Drang at 2,100 m in October (Evans 1914). Specimens from Phasama, Naga Hills (♂: 29.viii.1924, ♀: 23.vii.1927) collected by O.C. Ollenbach are kept in NFIC. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded as 'rare' and distributed in Sikkim and Assam, Nagaland (Evans 1932; Haribal 1992; Wynter-Blyth 1957). Recorded between 2,500 and 2,800 m in forested areas in Sikkim. One individual recorded from Trashiyangtse valley, eastern Bhutan in August (Wangdi *et al.* 2013).

**55. Peal's Palmfly *Elymnias peali*** Wood-Mason, 1883

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** Seven individuals.

**Locality and Date of sighting:** Locally uncommon in Namdapha Tiger Reserve, Changlang district. A few individuals recorded on 20–21.iii.2013 (5 nos) and 27–28.xi.2013 (2 nos) between 271–487 m on Mipen-Deban-Haldibari route in and around Namdapha.

**Notes:** Distributed in Assam and recorded as 'very rare' (Evans 1932; Wynter-Blyth 1957). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in May, November, and December (Sondhi *et al.* 2013).

**56. Blue Striped Palmfly *Elymnias patna patna*** Westwood, 1851

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Eight individuals.

**Locality and Date of sighting:** Six sightings from Namdapha TR, Changlang district (20–21.iii.2013 between 289 and 336 m); Anini and Etalin in Dibang valley on 14–15.viii.2012 at 781–1,706 m; Udyak Pass and Hyulung, Lohit district on 09.viii.2014 between 548 and 670 m.

**Notes:** Specimens from Khasi Hills (♂: 16.vi.1913, ♀: 13.vii.1908) collected by O.C. Ollenbach are kept in NFIC. Recorded as 'not rare' from Kumaon (Uttarakhand) to N. Myanmar (Evans 1932). Found during autumn in lower

valleys of Sikkim (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded from Garo Hills in March–April (Sondhi *et al.* 2013). Specimens collected in October in Tripura by Lodh and Agarwala (2015). Recently recorded at 900 m in December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**57. Spotted Palmfly *Elymnias malelas malelas*** Hewitson, 1863

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded on 27.xi.2013 at 487 m in Namdapha Tiger Reserve, Changlang district, inside evergreen forest.

**Notes:** Recorded as 'not rare' from Sikkim to Dawnas (Myanmar) (Evans 1932). Common during monsoon and autumn up to 900 m (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Common in east to central Nepal (Nawalparasi and Kaski districts) from the Terai to 1,500 m from March–May and July–November (Smith 1989). Recorded in July, August, and November in Tashiding, Legship, Yoksum, and Naya Bazaar in Sikkim, seen courting in banana plantation (Haribal 1992). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Singh and Chib (2014) recorded it from Mendrelgang, Tsirang district, Bhutan. Recorded from Garo Hills in May (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in March and October (Sondhi and Kunte 2014). Two specimens collected in October–November from Killa at 70 m in Gomati district and Baisnabpur in South district, Tripura at 29 m altitude by Lodh and Agarwala (2015). Recently recorded between 28 and 100 m from January–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**58. Tiger Palmfly *Elymnias nesaea*** Linnaeus, 1764

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded from Pakke Tiger Reserve in West Kameng district at 230 m on 06.ii.2013.

**Notes:** Specimens from Khasi Hills (♂: 12.ix.1907, ♀: 11.ix.1907) collected by O.C. Ollenbach are kept in NFIC. Recorded as 'not rare' from Sikkim to North Myanmar (Evans 1932) including Assam at low elevations (Wynter-Blyth 1957). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills during March–May, November–December (Sondhi *et al.* 2013), from Pakke Tiger Reserve in October (Sondhi and Kunte 2014), and Gibbon Wildlife Sanctuary, near Jorhat, Assam

in May–June (Singh *et al.* 2015). Specimens collected in October in Tripura by Lodh and Agarwala (2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**59. Scarce Blue Oakleaf *Kallima knyvettii*** de Nicéville, 1886  
**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single sighting below Mayodia Pass, Dibang valley at 2,039 m on 08.viii.2012 amongst debris under moist rocks.

**Notes:** Specimens from Naga Hills (♂: 12.ix.1924, ♀: 10.xi.1924) collected between 1,800 and 2,100 m by O.C. Ollenbach are kept in NFIC. Recorded as rare from Sikkim to Dawnas in Southern Myanmar (Evans 1932). Recorded in Sikkim-Darjeeling area between 1,500 and 2,100 m and Naga Hills from July–November (Wynter-Blyth 1957). Betts (1950) recorded it during July–August at Apa Tani (1,800 m) in Subansiri area in evergreen forest on carrion or rotten fruit. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014). Recorded from Trashiyangtse valley, eastern Bhutan from Bumdeling to Tarphel at 1,900–2,100 m in August (Wangdi *et al.* 2013).

**60. Wizard *Rhinopalpa polynice birmana*** Frühstorfer, 1897  
**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 20+ individuals.

**Locality and Date of sighting:** Locally common between 257–487 m in Namdapha on 12.xii.2012 and 27.xi.2013; also in Deomali, Tirap district at 128–137 m from 11–14.ix.2014.

**Notes:** Specimens of *birmana* from Manipur (♂: 07.iii.1905) and Taungpila, Tavoy, Tenasserim, Myanmar (♀: 10.ix.1925) collected by O.C. Ollenbach are kept in NFIC. The species *Rhinopalpa polynice* is ‘rare’ from Assam to Myanmar (Evans 1932). Recorded in Naga Hills and Digboi, Assam in September (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Pakke Tiger Reserve in March–April and September–October (Sondhi and Kunte 2014).

**61. Dot-dash Sergeant *Athyma kanwa phorkys*** Frühstorfer, 1912

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 15+ individuals.

**Locality and Date of sighting:** Local and fairly common in semi-evergreen forests. Recorded at 271 m in Namdapha Tiger Reserve on 21.xii.2011 and 20.iii.2013, and in Deomali,

Tirap district at 338 m in 03–05.vi.2015.

**Notes:** Recorded as ‘rare’ from Assam to Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Also, recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Pakke Tiger Reserve in April and October (Sondhi and Kunte 2014), and Gibbon Wildlife Sanctuary, near Jorhat, Assam in January–April (Singh *et al.* 2015). Recently recorded between 250 and 1,100 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**62. Studded Sergeant *Athyma asura asura*** Moore, 1857  
**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded on 08.ii.2013 at 1,564 m in Eaglenest Wildlife Sanctuary, West Kameng.

**Notes:** One male specimen collected from Lower Tsang Po river in Dibang valley at 900 m in June (Evans 1914). A specimen from Tavoy, Myanmar (♀: 17.i.1920) collected by O.C. Ollenbach is kept in NFIC. Recorded from Irangmara in Cachar Hills in July (Wood-Mason and de Nicéville 1886). Recorded as rare from Kullu in Himachal Pradesh to Tavoy in Myanmar (Evans 1932). Betts (1950) recorded it during August and October at Pite (600 m) and Apa Tani (1,800 m), in Subansiri area in Arunachal on river rocks. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills in March–May (Sondhi *et al.* 2013), from Pakke Tiger Reserve in September (Sondhi and Kunte 2014). Specimen collected in May from Debbari in Gomti district, Tripura at 48 m in semi-evergreen forest (Lodh and Agarwala 2015). Recently recorded at 30 m from March in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**63. Unbroken Sergeant *Athyma pravara acutipennis*** Frühstorfer, 1906

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 19 individuals.

**Locality and Date of sighting:** Two individuals recorded from Namdapha TR between 271–338 m on 21.xii.2011 and 20.iii.2013, 17 individuals recorded from different parts of the state mainly at lower elevations.

**Notes:** Recorded from Irangmara in Cachar Hills in July (Wood-Mason and de Nicéville 1886). Recorded as rare from Assam to Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Also, recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in November (Sondhi *et al.* 2013),

from Pakke Tiger Reserve in September and October (Sondhi and Kunte 2014), and Gibbon Wildlife Sanctuary, near Jorhat, Assam in March–April (Singh *et al.* 2015). Recently recorded between 28 and 800 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**64. Bhutan Sergeant *Athyma jina jina* Moore, 1857**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record on 12.vii.2014 at 786 m near Hayuliang in Anjaw district, sucking minerals from wet sand. This is the easternmost record of this taxa in India.

**Notes:** Two males collected from Lower Tsang Po river in Dibang valley at 1,650 m in June and one male in Dhirang at 1,950 m in October (Evans 1914). Recorded as ‘very rare’ from Nepal to Sikkim and Bhutan (Evans 1932; Wynter-Blyth 1957). Fairly common in forested areas between 800 and 1,850 m in Bhutan (van der Poel and Wangchuk 2007), and in Trashiyangtse valley, eastern Bhutan from Bumdeling in August (Wangdi *et al.* 2013).

**65. Tytler’s Sergeant *Athyma whitei* Tytler, 1940**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded on 08.viii.2014, 20 km ahead of Hayuliang towards Walong in Anjaw district, sucking minerals from wet sand. This is the only record of this species from Arunachal Pradesh.

**Notes:** Found in Chin Hills in N. Myanmar, South Vietnam, Hainan, and China (Inayoshi 2012) and recently recorded from Cachar Hills in south Mizoram and south Assam in 2012 and 2013 (Gogoi 2014). Recently recorded at 28 m altitude from December–March in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**66. Perak Lascar *Pantoporia paraka paraka* Butler, 1877**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded at 137 m on 14.ix.2014 in Deomali, Tirap district.

**Notes:** ‘Not rare’ from Assam to Myanmar (Evans 1932). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and from Gibbon Wildlife Sanctuary near Jorhat, Assam (Singh *et al.* 2015). Recorded from Garo Hills in November–December (Sondhi *et al.* 2013), and Pakke Tiger Reserve in June (Sondhi and Kunte 2014). Recently recorded at 28 m in March from Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**67. Yellow Sailer *Neptis ananta ochracea* Evans, 1924**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Four individuals.

**Locality and Date of sighting:** Recorded at 327 m and 331 m on 20.iii.2013 and 29.xi.2013, respectively in Namdapha TR. Again on 06.viii.2014 at 528 m in Lohit district and on 09.viii.2014 at 834 m in Anjaw district.

**Notes:** Specimens from Sikkim (♂: 20.i.1921, ♀: 13.iv.1916) collected by O.C. Ollenbach are kept in NFIC. Recorded as ‘rare’ from Sikkim to Dawnas (Evans 1932). Recorded in Naga hills from March to October (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Common in Central Nepal (Parbat and Kathmandu) at 960–2,342 m, from April to June and September to December (Smith 1989). Prefers well-wooded nullahs and forest edges between 400 and 2,000 m, collected near Pashok in Sikkim (Haribal 1992). Recorded along the Sankosh river in lowland forests of Bhutan adjoining Buxa Tiger Reserve in winter (Singh 2012). Also, recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in March (Sondhi *et al.* 2013).

**68. Great Yellow Sailer *Neptis radha radha* Moore, 1857**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Recorded from Pakke Tiger Reserve at 132 m on 18.xii.2013; from Upper Dibang valley on Anini-Mippi road on 14.viii.2012 and 07.vi.2014, at 759 m and 1,706 m, respectively.

**Notes:** Specimens from Naga Hills at 2,100 m (♂: 07.vi.1926) and Bhutan (♀: 12.ix.1926) collected by O.C. Ollenbach are kept in NFIC. Recorded from Nemotha in Cachar Hills in September (Wood-Mason and de Nicéville 1886). Recorded as rare from Kumaon (Uttarakhand) to Assam (Evans 1932). Betts (1950) recorded it during November at Pite (600 m) in Subansiri area on river rocks. Recorded in spring and autumn between 1,350 and 2,250 m in Sikkim-Darjeeling area (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Rare in Central Nepal (Kashi and Kathmandu) between 1,100 and 2,200 m during May, September, and November (Smith 1989). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m.

**69. Spotted Sailer *Neptis magadha khasiana* Moore, 1872**

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** 10+ individuals.

**Locality and Date of sighting:** Local. Fairly common along the forest edge near Namdapha TR, Changlang district, entry gate towards Deban on 12.xii.2012 and 20.iii.2013 between

256 m and 366 m. Recorded around Hayuliang, Anjaw district at 531 m on 07.viii.2014 and on 14.ix.2014 at 137 m in Deomali, Tirap.

**Notes:** A specimen from Maymyo, Shan States, Myanmar (♂: 23.x.1926) collected by O.C. Ollenbach is kept in NFIC. Recorded as rare from Bhutan to N. Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). 'Not common' at lower altitudes in east and central Nepal (Kashi district) from the Terai to 870 m during March, April, July, September, and November (Smith 1989). Recorded from Garo Hills in March–April (Sondhi *et al.* 2013), and Pakke Tiger Reserve in October (Sondhi and Kunte 2014). Recently recorded between 28 and 110 m from January–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**70. Great Hockeystick Sailer *Phaedyra aspasia aspasia*** Leech, 1890

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** One individual was recorded near Etalin at 759 m altitude on 07.vi.2014 and another on 08.vi.2014 on Anini-Mippi road, in Upper Dibang Valley. Probably the first record from Arunachal Pradesh.

**Notes:** Recorded as rare and known to occur in south-west China, Nagaland in India and N. Myanmar (Evans 1932), and now Arunachal Pradesh in the present study.

**71. Bronze Duke *Euthalia nara nara*** Moore, 1859

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Two records, one from Sessa along the highway at c. 1,000 m on 29.vii.2013, West Kameng and another near Anini at 1,706 m, Dibang valley on 14.viii.2012.

**Notes:** Specimens from Phesama, Naga Hills at 2,100 m (♂: 18.viii.1924 and ♀: 29.viii.1924) between 1,800 and 2,100 m collected by O.C. Ollenbach are kept in NFIC. Recorded as 'rare' from Sikkim to Shan states in N. Myanmar (Evans 1932), including Assam (Wynter-Blyth 1957). 'Not Common' in central Nepal (Kathmandu and Rasuwa district), between 1,500 and 1,900 m in June–July (Smith 1989). A few individuals recorded from Trashiyangtse valley, eastern Bhutan from 1,900–2,200 m in August (Wangdi *et al.* 2013).

**72. Green Duke *Euthalia sahadeva sahadeva*** Moore, 1859

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** One female from Dambuine, near Anini at 1,706 m on 14.viii.2012 and one male on 26.viii.2013 at 1,554 m from Dambuine, in Upper Dibang Valley.

**Notes:** Specimens from Phesama, Naga Hills at 2,100 m (♂: 22.viii.1924, ♀: 14.viii.1925) at 2,100 m collected by O.C. Ollenbach are kept in NFIC. Recorded as not rare from Sikkim to Bhutan (Evans 1932), including Assam and Myanmar and common in Naga Hills and Sikkim-Darjeeling area between 1,200 and 1,500 m (Wynter-Blyth 1957). Betts (1950) recorded it during July–August in Apa Tani (Zero) at 1,800 m in dense evergreen forest. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Rare in Central Nepal (Kashi and Kathmandu district), between 1,200 and 2,000 m in June–September (Smith 1989). Fairly common in forested areas between 800 and 2,000 m in Bhutan (van der Poel and Wangchuk 2007) from Trashiyangtse valley, eastern Bhutan from Trashy Yangtse to Bumdeling in August (Wangdi *et al.* 2013). Found up to 1,800 m in Sikkim, and one record from Orchid Sanctuary in Gangtok (Haribal 1992). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014).

**73. French Duke *Euthalia franciae*** Gray, 1846

**a. *Euthalia franciae franciae*** Gray, 1846

**Status:** Schedule II, Part II, IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Subspecies *francae* was recorded in Namdapha Tiger Reserve at 460 m on 28.iii.2012, where it prefers lower elevation forest. Also recorded in Dibang valley district at 680 m on 14.viii.2012 and in Anjaw district near Hayuliang at 786 m on 12.viii.2015.

**Notes:** Specimens of *francae* from Khasi Hills (♀: June 1905) collected by O.C. Ollenbach are kept in NFIC. One male collected from Lower Tsang Po, Dibang valley at 900 m (Evans 1914). This subspecies is found in Sikkim, Nepal, and Bhutan and is rare (Evans 1932), including Assam (Wynter-Blyth 1957). Betts (1950) recorded it during October at Lichi (1,050 m) in evergreen forest. Recorded in Sikkim in May at 1,500 m, in Naga Hills from April to August and during August in Assam (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). In Nepal, this subspecies is found only in Kathmandu valley where it is rare between 1,360 and 1,900 m from April to June and September (Smith 1989). Later, Khanal *et al.* (2013b) collected 3 specimens of *E. f. franciae* from Central Nepal between 1,363 and 1,940 m. In Sikkim it was recorded in dense forests in summer up to 1,500 m, one specimen collected from Tholung valley (Haribal 1992).

**b. *Euthalia franciae rajah*** Felder & Felder, 1859**Specimens recorded:** Seven individuals.**Locality and Date of sighting:** The second subspecies *rajah* was recorded at a relatively higher elevation than subspecies *francae* (1,467–2,290 m) near Mayodia Pass, while moving towards Hunli in Upper Dibang valley district. Six individuals were recorded on 14–15.viii.2012 on the forest road. Also recorded between Anini and Mippi on 10.viii.2012.**Notes:** Subspecies *rajah* is rare and ranges from Assam to Karen in Myanmar (Evans 1932). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Specimens of *rajah* from Jakama, Naga Hills (♂: 20.viii.1924, ♀: 08.ix.1926) at 1,800 m, collected by O.C. Ollenbach are kept in NFIC.**74. Grey Baron *Euthalia anosia anosia*** Moore, 1857**Status:** Schedule II, Part II, IWPA (1972).**Specimens recorded:** One individual.**Locality and Date of sighting:** Recorded on 14.ix.2014 at 137 m altitude in Deomali, Tirap district in semi-evergreen forest.**Notes:** Specimens from Pagaye, Tavoy, Tenasserim, Myanmar (♂: 03.xii.1909), Khasi Hills (♂: 11.vii.1905), and Darjeeling-Sikkim (♀: 19.x.1917) collected by O.C. Ollenbach are kept in NFIC. Recorded from Irangmara, Lalla Mookh, and Nemotha in Cachar Hills in June, July, and September (Wood-Mason and de Nicéville 1886). A 'rare' species distributed from Assam to Myanmar (Evans 1932), recorded at lower elevations in Assam (Wynter-Blyth 1957). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and from Gibbon Wildlife Sanctuary near Jorhat, Assam in March and April (Singh *et al.* 2015). Recorded from Garo Hills in December (Sondhi *et al.* 2013), and from Pakke Tiger Reserve in May–June and September–October (Sondhi and Kunte 2014). Recently recorded in March at 28 m from Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).**75. Dark Archduke *Lexias dirtea khasiana*** Swinhoe, 1893**Status:** Schedule II, Part II (IWPA 1972).**Specimens recorded:** 20+ individuals.**Locality and Date of sighting:** Locally common at lower elevation semi-evergreen forest in and around Deomali, Tirap district (14–15.ix.2014) at 336 m, and Namdapha in Changlang district (14.xii.2012; 21.iii.2013; 28–29.xi.2013), between 331 and 428 m.**Notes:** Specimens from Pagaye, Tavoy, Myanmar (♂: 23.iv.1907), Kandan, Tavoy, Myanmar (♀: 10.vi.1915)and Khasi Hills (♀: 11.vi.1906 and 23.iv.1907) collected by O.C. Ollenbach are kept in NFIC. Recorded as rare and restricted to Assam (Evans 1932), Sikkim, Bhutan, and hills of north-east India (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills in April–May (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in March–October (Sondhi and Kunte 2014), and Gibbon Wildlife Sanctuary, near Jorhat, Assam where it is seen throughout the year (Singh *et al.* 2015). Specimens collected in May from Debbari in Gomti district, Tripura at 48 m in semi-evergreen forest (Lodh and Agarwala 2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).**76. Sordid Emperor *Chitoria sordida sordida*** Moore, 1865**Status:** Schedule II, Part II, IWPA (1972).**Specimens recorded:** One individual.**Locality and Date of sighting:** Rare. Recorded sapsucking on a bridge near Parshuram Kund in Lohit district, at 344 m on 07.viii.2014. Probably first record from Arunachal Pradesh.**Notes:** Specimens from Darjeeling hills (06.ix.1914 and 07.x.1914) collected by O.C. Ollenbach and another one (♂: June 1955) collected by G.D. Bhasin from as far west as Dwarkanath in Chakrata Hills in Uttarakhand (western Himalaya), are kept in NFIC. The species *Chitoria sordida* is reported from Manipur throughout the summer and autumn. A single specimen was also collected on Silchar road in October and was extremely local (Tytler 1915). This 'rare' subspecies *C. s. sordida* is known to occur in Sikkim, Bhutan, Naga Hills, N. Myanmar (Evans 1932), and was recorded at 1,800 m in Naga Hills (Wynter-Blyth 1957). Collected from West Sikkim in November (Haribal 1992). Recently, Singh and Chib (2014) recorded it from Mendrelgang, Tsirang district, Bhutan at 1,179 m during October 2012 where several individuals were seen sipping on exudate of orange tree in orchards. The species *C. sordida* is seen on the wing from April to November and flies at low elevation around 2,000 m in Naga Hills (Kehimkar 2008). Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014).**77. Brown Prince *Rohana parvata parvata*** Moore, 1857**Status:** Not listed in IWPA (1972).**Specimens recorded:** One individual.**Locality and Date of sighting:** Single record between Tippi and Sessa, West Kameng district, licking salt from roadside rocks at 325 m on 10.vii.2012.

**Notes:** A rare species *Rohana parvata* distributed from Sikkim to Assam (Evans 1932), Sikkim-Darjeeling area between 1,200 and 1,500 m (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m.

**78. Eastern Courtier *Sephis chandra chandra* Moore, 1857**

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** Four individuals.

**Locality and Date of sighting:** Recorded between Anini and Dambuine in Upper Dibang valley on 13.viii.2012, between 1,400 and 1,554 m.

**Notes:** Specimens from Sikkim (♂: 10.ix.1919) and Phesama, Naga Hills at 1,800 m (♀: 29.ix.1925) collected by O.C. Ollenbach are kept in NFIC. A 'very rare' species *Sephis chandra* distributed from Sikkim to Karen in Myanmar (Evans 1932), including Assam and 'fairly common' at lower elevations in Sikkim (Wynter-Blyth 1957). Betts (1950) recorded it during August and October at Pite (600 m) in Subansiri area on the riverbed. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Found in nullahs bordering forested areas and along streams up to 1,500 m in north and west Sikkim (Haribal 1992). 'Not rare' from east to central midlands (Kaski and Syanja districts), Nepal in April–June and August to November. Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Trashiyangtse valley, eastern Bhutan from Trashiyangtse town in August (Wangdi *et al.* 2013).

**79. White Commodore *Parasarpa dudu dudu* Westwood, 1850**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** First recorded from Namdapha at 470 m on 28.iii.2012, second between Bomdila-Dirang, West Kameng district at 1,746 m on the road on 31.vii.2013, and the third recorded between Hayulung-Khesung, Anjaw district at 786 m on 08.viii.2014.

**Notes:** One male specimen collected from the state (Evans 1914). Specimens from Khasi Hills (♂: 04.vii.1906, ♀: 28.vi.1925) collected by O.C. Ollenbach are kept in NFIC. A 'rare' species *Parasarpa dudu* distributed from Sikkim to Shan states in Myanmar (Evans 1932). Common in Naga Hills in April and from August–November between 1,350 and 1,800 m (Wynter-Blyth 1957). Specimen collected from west Sikkim, recorded between 1,200 and 1,500 m where it

flies around tree tops and highest point on the ridges (Haribal 1992). 'Not Rare' and recorded only in Central Nepal (Kaski and Kathmandu districts) from 1,500–2,600 m during April–October (Smith 1989). Fairly common in grassland and sandy river banks between 1,400 and 2,500 m in Bhutan (van der Poel and Wangchuk 2007), from Trashiyangtse valley, eastern Bhutan from Trashy Yangtse town to Bumdeling in August (Wangdi *et al.* 2013). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Khanal *et al.* (2013) collected two specimens from Central Nepal between 1,850 and 1,880 m. Recorded during May–June in Neora Valley National Park, West Bengal, India (Sengupta *et al.* 2014).

**80. Commodore *Auzakia danava danava* Moore, 1857**

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** One individual recorded at Etalin (673 m) in Dibang valley on 10.viii.2012, near Eaglenest Sanctuary at 1,564 m on 08.ii.2013 and between Hayulung-Khesung towards Walong, Anjaw district at 786 m on 08.viii.2014.

**Notes:** One male specimen collected from Arunachal Pradesh (Evans 1914). Specimens from Naga Hills (♂: 03.x.1924, ♀: 05.ix.1926) and Kirbari, Naga Hills (♂: 11.x.1918) collected by O.C. Ollenbach are kept in NFIC. A rare species *Auzakia danava* distributed from Shimla in Himachal Pradesh to Dawnas in Myanmar (Evans 1932), recorded as common in Naga Hills from August–November (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). 'Not Rare' in Kathmandu valley but rare in Kashi and Doti districts from 870–1,800 m during April–September (Smith 1989). Recorded by Borang *et al.* (2008) in Dihang-Dibang Biosphere Reserve and by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Pakke Tiger Reserve in April (Sondhi and Kunte 2014).

**81. Grey Commodore *Bhagadatta austenia austenia* Moore, 1872**

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** 5+ individuals.

**Locality and Date of sighting:** Several records from Dibang valley between 680 and 2,290 m during June and August (14.viii.2012; 30–31.viii.2013; 07.vi.2014; 07.viii.2014).

**Notes:** Three male specimens collected from Lower Tsang Po river in Dibang valley between 800 and 1,800 m in June (Evans 1914). A specimen of subspecies *austenia* from Mokochong, Naga Hills (♂: 12.vi.1926) collected by

O.C. Ollenbach is kept in NFIC. A ‘rare’ subspecies distributed from Assam to N. Myanmar (Evans 1932), in Naga hills and Manipur in April–May and July–September (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Recorded in Garo Hills from March–May (Sondhi *et al.* 2013). Borang *et al.* (2008) recorded another subspecies *B. a. purpurascens* between 600 and 1,000 m as ‘very rare’ in October–November in Dihang-Dibang Biosphere Reserve.

## 82. Empress *Sasakia funebris funebris* Leech, 1891

**Status:** Schedule I, Part IV, IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record on Anini-Mippi road, Dibang Valley on 13.viii.2012 at 1,706 m. Details of this record have been published earlier by the author (Singh 2013).

**Notes:** Four specimens of this species were collected at Yakama (=Jakhama), Naga Hills (Nagaland) at 1,520 m in July in 1911 and 1912 (Tytler 1915). A specimen (♂: 25.vi.1924) from Jakhama, Naga Hills at 1,800 m, collected by O.C. Ollenbach is kept in NFIC. ‘Very rare’, earlier recorded only from Naga Hills in India (Evans 1932).

## 83. Panther *Neurosigma siva siva* Westwood, 1850

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** A male near Tato, Upper Subansiri at 1,520 m on 01.ix.2012.

**Notes:** Specimens from Khasi Hills (♂: 07.iii.1906, ♀: 14.vii.1908) collected by O.C. Ollenbach are kept in NFIC. Recorded as rare from Sikkim to Chittagong in Bangladesh (Evans 1932); Sylhet, Cachar, hills of Assam and Myanmar, and Sikkim in spring, and from Assam in spring and autumn between 1,200 and 1,500 m (Wynter-Blyth 1957). Betts (1950) recorded it in October at Tasser Pttu (1,050 m) in dense evergreen forest in Subansiri area. A rare subspecies that flies during spring and October between 1,300 and 1,500 m in Sikkim (Haribal 1992). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. One individual recorded from Trashiyangtse valley, eastern Bhutan from Duksum to Trashiyangtse town in August (Wangdi *et al.* 2013).

## 84. Constable *Dichorragia nesimachus nesimachus* Doyère, 1840

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Five individuals.

**Locality and Date of sighting:** Recorded at higher elevations from 1,706 m on Mippi-Anini road on 14.viii.2012, and four individuals at lower elevation in semi-evergreen forest at

Deomali, Tirap district on 14.ix.2014 between 125–154 m. **Notes:** Specimens from Khasi Hills (♂: 16.vii.1908) and at Pump Station in Mussoorie, Uttarakhand (♀: 20.vi.1915) collected by O.C. Ollenbach are kept in NFIC. The species *Dichorragia nesimachus* is ‘not rare’ from Kullu (Himachal Pradesh) to Myanmar (Evans 1932) including Assam and in Sikkim flies up to 750 m (Wynter-Blyth 1957). Betts (1950) recorded it during February and May at Lichi (750 m) and Pite (600 m) in Subansiri area, as common at 1,200 m where it was seen settling on tree trunks. In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). ‘Rare’ in Nepal between 300 m and 2,072 m during March, April, June, September, and November (Smith 1989). Flies up to 900 m and has two broods, one before and one after the rains when it visits damp patches, waste, and refuse in Sikkim (Haribal 1992). Recorded by Borang *et al.* (2008) between 900 and 1,100 m as a rare subspecies *D.n. nesimachus* in October–November in Dihang-Dibang Biosphere Reserve and by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and from Garo Hills in May (Sondhi *et al.* 2013). Recorded at Gibbon Wildlife Sanctuary near Jorhat, Assam in March, April, and December (Singh *et al.* 2015), and from Pakke Tiger Reserve in September–October (Sondhi and Kunte 2014).

## 85. Yellow Kaiser *Penthema lisarda lisarda* Doubleday, 1845

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Five individuals.

**Locality and Date of sighting:** All individuals recorded between 358 and 732 m near Kamlang Wildlife Sanctuary and Wakro-Kamlang road, Lohit district on 05–06.viii.2014.

**Notes:** Specimens from Katha, Myanmar (♂: 10.v.1907) and Darjeeling (♀: 19.xi.1912) collected by O.C. Ollenbach are kept in NFIC. ‘Rare’ from Sikkim to Manipur (Evans 1932). Recorded in Sikkim-Darjeeling area at Dikchu and Singhik at 600–650 m in May (Wynter-Blyth 1957). In ZSI records from Arunachal Pradesh (Gupta and Shukla 1988). Collected by Bailey and Dudgeon from Daling and Singal areas in Sikkim and from Arunachal Pradesh in May (Haribal 1992). Recorded by Borang *et al.* (2008) between 400 and 900 m as a common subspecies *Penthema lisarda lisarda* in Dihang-Dibang Biosphere Reserve, and by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills in March–April (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in April (Sondhi and Kunte 2014). Recently recorded at 110 m in March from Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).

**86. Red Caliph *Enispe euthymius euthymius*** Doubleday, 1845

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Single record from Haldibari forest at 398 m on 21.iii.2013 and another near 'Camera Point' on Mipen-Gandhigram route on 27.xi.2013, both in Namdapha Tiger Reserve, Changlang district.

**Notes:** One male collected from Arunachal Pradesh (Evans 1914). Specimens from Sikkim (♂: 16.ix.1914) and Khasi Hills (♀: 18.ix.1925) collected by O.C. Ollenbach are kept in NFIC. Recorded from Nemotha in Cachar Hills in September (Wood-Mason and de Nicéville 1886). Occurs from September to March at lower elevations in Sikkim (Haribal 1992). Also recorded from Garo Hills in May (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in September (Sondhi and Kunte 2014). Recently recorded in January from Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**87. Jungle Glory *Thaumantis diores diores*** Doubleday, 1845

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Seven individuals.

**Locality and Date of sighting:** Recorded at several locations on 28.xi.2013 in evergreen forest on Deban to Haldibari trek route in Namdapha Tiger Reserve between 357 and 428 m.

**Notes:** Recorded from Nemotha in Cachar Hills in September and November (Wood-Mason and de Nicéville 1886). One male collected from Arunachal Pradesh (Evans 1914). Specimens of species *Thaumantis diores* from Khasi Hills (♂: 17.v.1904, ♀: 14.vi.1926) collected by O.C. Ollenbach are kept in NFIC. The subspecies *T. d. diores* was recorded as not rare from Sikkim to N. Myanmar (Evans 1932), and as rare in Sikkim-Darjeeling area at 750 m (Wynter-Blyth 1957). Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a). Recorded from Garo Hills in March, May, November, and December (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in October (Sondhi and Kunte 2014). Recently recorded at 30 m in March from Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**88. Manipur Jungle Queen *Sticopthalma sparta tytleri*** Rothchild, 1918

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Eight individuals.

**Locality and Date of sighting:** Recorded from 10–13. viii.2012, in Upper Dibang valley on Anini-Mippi Road and also near Etalin, Dibang valley district between 1,659 and 1,706 m.

**Notes:** Specimens from Mokokchoung, Naga Hills (♂: 07.vii.1926) collected by O.C. Ollenbach are kept in NFIC. This subspecies was 'not rare' in Manipur, Abhor, Naga Hills, Kindat, Katha, and N. Myanmar (Evans 1932). Flies in Manipur in April and June and in Naga Hills in September (Wynter-Blyth 1957).

**89. Northern Jungle Queen *Stichopthalma camadeva nicevillei*** Röber, 1900

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Three individuals.

**Locality and Date of sighting:** Recorded on 13–14.viii.2012 on Anini-Mippi road, Dibang Valley between 1,659–1,706 m.

**Notes:** Specimens of this subspecies from Singe, Sikkim (♂: 26.v.1919, ♀: September 1912) collected by O.C. Ollenbach are kept in NFIC. Recorded from Silcuri in Cachar Hills in May (Wood-Mason and de Nicéville 1886). Known to be not rare and restricted to Sikkim (Evans 1932). Very common in Cachar (Assam) and between 600 and 900 m during June–July in Sikkim-Darjeeling area (Wynter-Blyth 1957). Was observed as rare during October in Orang Wildlife Sanctuary, Assam (Basistha *et al.* 1999).

**90. Great Duffer *Discophora timora timora*** Westwood, 1850

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record from Deomali, Tirap at 135 m on 11.ix.2014.

**Notes:** Recorded as 'not rare' from Sikkim to Myanmar (Evans 1932), including Bengal and Assam (Wynter-Blyth 1957). Recently recorded from Gibbon Wildlife Sanctuary, near Jorhat, Assam in September (Singh *et al.* 2015). Specimen collected in August from Chauribari, in North district, Tripura at 53 m in semi-evergreen mixed deciduous forest (Lodh and Agarwala 2015). Recently recorded at 28 m from January–March in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**91. Tiger-mimic Admiral *Limenitis rileyi*** Tytler, 1940

**Status:** Not yet given.

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Photographed licking salt on a rock on the road between Anini and Mippi, 10 km from Anini in Upper Dibang valley, at c. 1,660 m on 13.viii.2012.

**Notes:** Known to occur in south-eastern Tibet, Myanmar, and North Vietnam with flight period from June to August between 1,600–2,400 m (Monastyrskii and Huang 2003; Devyatkin 2000; Shizuya *etal.* 2011).

## Hesperiidae

**92. Slate Awl *Hasora anura*** de Nicéville, 1889

a. *Hasora anura anura* de Nicéville, 1889

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Single record on 07.vi.2012 at 1,270 m, sucking minerals from wet sand on the road near Etalin in Upper Dibang valley.

**Notes:** A large number *Hasora anura anura* were obtained by Tytler (1915) in Jakama and Kirbari, Naga Hills between 188 and 2,100 m and Suroifui, Manipur from July to October and at Imphal (900 m) during June. Rare distributed from Mussoorie (Uttarakhand) to Shan States in Myanmar, Thailand, S.W. and S. China (Evans 1932). Only one record from central Nepal (Kaski district) at 900 m in December (Smith 1989). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m.

b. *Hasora anura china* Evans, 1949

**Status:** Not yet assessed.

**Specimens recorded:** Three individuals photographed.

**Locality and Date of sighting:** Recorded around Mayodia Pass between 2,039 and 2,079 m, in Dibang valley on 09.viii.2012.

**Notes:** First record from India.

**93. Pale Green Awlet *Burara gomata gomata*** Moore, 1865

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded on 07.vi.2014 at 1,267 m near Etalin in Dibang valley.

**Notes:** Specimens from Khasi Hills (♂: June 1916) and Sikkim (♀: 16.viii.1920) collected by O.C. Ollenbach are kept in NFIC. Distributed from Sikkim to Assam, recorded as 'not rare' (Evans 1932). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b). Recorded from Pakke Tiger Reserve in May and September (Sondhi and Kunte 2014). Recently recorded between 28 and 90 m from March–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**94. Small Green Awlet *Burara amara*** Moore, 1865

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Four individuals.

**Locality and Date of sighting:** Recorded at 212 m at 'Sally lake' close to Roing in Dibang valley on 05.viii.2012, at Tezu, Lohit district on 06.viii.2012, and also at 1,635 m on

13.ix.2014 at Thinsa in Tirap district.

**Notes:** A specimen from Khasi Hills (♂: 18.x.1921) collected by O.C. Ollenbach is kept in NFIC. A rare species distributed from Sikkim to Shan states in Myanmar and Andamans (Evans 1932). 'Rare' from east to central Nepal (Kaski district) from the Terai to 950 m in May, June, and August (Smith 1989). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded along the Sankosh river in lowland forests of Bhutan adjoining Buxa Tiger Reserve in winter (Singh 2012). Also recorded from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b) and from Pakke Tiger Reserve in May and September (Sondhi and Kunte 2014).

**95. Hooked Awlking *Choaspes furcata*** Evans, 1932

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded at 1,267 m near Etalin in Dibang valley on 07.vi.2014, sucking sap from refuse.

**Notes:** A 'rare' species distributed from Sikkim to Manipur (Evans 1932), while Smith (1989) gives distribution from Kumaon (Uttarakhand) to Sikkim and Assam, and west China. Also recorded from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b).

**96. Wax Dart *Cupitha purreea purreea*** Moore, 1877

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded at 186 m on 18.xii.2013 at Pakke Tiger Reserve, West Kameng district.

**Notes:** Specimens from Pagaye, Tavoy (♂: 05.i.1920) and Sabataung, Tavoy, Myanmar (♀: 26.xii.1919) collected by O.C. Ollenbach are kept in NFIC. Recorded from Sebong, Manipur in March–April and October–November (Tytler 1915). *Cupitha purreea purreea* was recorded as 'not rare' and distributed from S. India, Sikkim to Myanmar, Andamans and Malayana (Evans 1932). 'Rare' in east and central Terai (Nawalparasi district) in Nepal at 510 m from March–June and August. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and is seasonally common in Panbari Reserve Forest and adjoining areas near Kaziranga-Karbi Anglong district in upper Assam (Gogoi 2013b). Recorded from Garo Hills in May, November, and December (Sondhi *et al.* 2013) and Pakke Tiger Reserve, West Kameng district in March and October (Sondhi and Kunte 2014). Two records in April from 'Atharamura North Circle' in Dhalai district, Tripura at 183 m (Lodh and Agarwala 2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**97. Greenish Palm Dart *Telicota ancilla horisha* Evans, 1934****Status:** Not listed in IWPA (1972).**Specimens recorded:** One individual.**Locality and Date of sighting:** Recorded near Dambuine in upper Dibang valley, at 1,554 m, nectar feeding on Umbelliferae flowers, on 13.viii.2012.**Notes:** Recorded by Evans (1934) as distributed from southern China to northern Vietnam, Taiwan. Also well-distributed from W. Himalaya to NE India (Evans 1949). Recorded from Panbari Reserve Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b).**98. Himalayan Yellow-banded Flat *Celaenorrhinus dhanada* Moore, 1865****Status:** Not listed in IWPA (1972).**Specimens recorded:** Two individuals.**Locality and Date of sighting:** Recorded from Namdapha, Changlang district at 357 m and 398 m on 21.iii.2013 and 28.xi.2013 respectively, and in Hayuliang, Anjaw district on 07.viii.2014 at 531 m.**Notes:** Specimens from Karen Hills, Myanmar (♂: 15.iv.1920) and Mussoorie, Uttarakhand (♂: 30.v.1919) collected by O.C. Ollenbach are kept in NFIC. Subspecies *affinis* recorded from April to May and November in Manipur and Naga Hills in November at 1,800 m (Tytler 1915). Distributed from Mussoorie (Uttarakhand) to Sikkim and recorded as rare (Evans 1932). Rare across Nepal in May, June, and September from 840–1,560 m (Smith 1989). Uncommon in open country and rocks below 1,800 m (van der Poel and Wangchuk 2007).**99. Dark Yellow-banded Flat *Celaenorrhinus aurivittata aurivittata* Moore, 1878****Status:** Not listed in IWPA (1972).**Specimens recorded:** Two individuals.**Locality and Date of sighting:** Recorded on 09.viii.2014 at 1,570 m at Udayak Pass and near Wakro at 286 m on 04.v.2012, Lohit district.**Notes:** Specimens from Khasi Hills (♂: May 1916) and Tavoy, Myanmar (♀: 20.xii.1920) collected by O.C. Ollenbach are kept in NFIC. Common at lower elevations in Manipur but 'not common' in Naga Hills (Tytler 1915). Distributed from Assam to South Myanmar and recorded as 'not rare' (Evans 1932). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Also recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a) and from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b). Recorded from Pakke Tiger Reserve in March and October (Sondhi and Kunte 2014). Recorded during August from Central Catchment Reserve Forest inDhalai district, Tripura at 180 m (Lodh and Agarwala 2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).**100. Tytler's Multi-spotted Flat *Celaenorrhinus ratna tytleri* Evans, 1926****Status:** Not listed in IWPA (1972).**Specimens recorded:** Two individuals.**Locality and Date of sighting:** One record from Menchuka valley in Upper Subansiri at 1,554 m on 12.viii.2012, and another from Udayak Pass in Lohit district on 09.viii.2014.**Notes:** Distributed from Mussoorie (Uttarakhand) to Manipur and was recorded as 'rare' (Evans 1932). Not common in central Nepal (Kashi and Kathmandu) at 1,650–2,600 m from June to September (Smith 1989). Four records from Trashiyangtse valley, eastern Bhutan where it is sparsely seen in forested tracts between 1,800 and 2,300 m (Wangdi *et al.* 2012).**101. Dusky Yellow-breasted Flat *Gerosis phisara phisara* Moore, 1884****Status:** Not listed in IWPA (1972).**Specimens recorded:** Four individuals.**Locality and Date of sighting:** Recorded in Arunachal between 235 and 1,203 m on 19.xii.2013 at Pakke Tiger Reserve, West Kameng district; 29.viii.2012 at Daporijo, Upper Subansiri; 01.v.2012 near Walong, Anjaw district; and 11.ix.2014 near Borduria, Tirap district.**Notes:** Specimens from Moulmein (Mawlamyine), Myanmar (♂: 18.i.1923) and Cachar, Assam (♀: 07.iv.1908) collected by O.C. Ollenbach are kept in NFIC. Distributed from Sikkim to Myanmar, Malaysia and recorded as 'not rare' (Evans 1932). Recorded from Garo Hills in April, May, and October (Sondhi *et al.* 2013) and from Pakke Tiger Reserve in October (Sondhi and Kunte 2014). Also recorded from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b) and Gibbon Wildlife Sanctuary, near Jorhat, Assam in September–October (Singh *et al.* 2015). Recently recorded at 28 m from January–December in Barail WLS, Cachar hills in southern Assam (Gogoi *et al.* 2016).**102. Yellow Flat *Mooreana trichoneura pralaya* Moore, 1865****Status:** Not listed in IWPA (1972).**Specimens recorded:** One individual.**Locality and Date of sighting:** Recorded at 550 m from Parshuram Kund area near Wakro, Lohit district on 06.viii.2014.**Notes:** Specimens from Khasi Hills (♂: 22.xi.1921, ♀: June 1916) collected by O.C. Ollenbach are kept in NFIC. Not rare from Sikkim to N. Myanmar (Evans 1932). Recorded in April, October–November at low elevations in Manipur,

and Gaspani, Nichuguard in Naga Hills in June and October (Tytler 1915). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Garo Hills in March, April, October (Sondhi *et al.* 2013). Recorded during August from 'Central Catchment Reserve Forest' in Dhalai district, Tripura at 180 m (Lodh and Agarwala 2015). Recently recorded at 28 m from January to December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**103. Northern Spotted Ace *Thoressa cerata*** Hewitson, 1876  
**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded near Deomali, Tirap district on 10.vi.2015 at 168 m in semi-evergreen forest.

**Notes:** A specimen from Sikkim (♂: 04.x.1918) collected by O.C. Ollenbach is kept in NFIC. 'Not rare' from Sikkim to Karen (Evans 1932). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a), and from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b). Recorded from Pakke Tiger Reserve, West Kameng district in April–May and September (Sondhi and Kunte 2014). Recently recorded at 28 m in December from Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**104. Luca's Ace *Sovia lucasii*** (Mabille, 1876)

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded on 11.viii.2012 at 1,564 m near Anini, upper Dibang valley and on 12.vii.2013 at 1,554 m near Lama Camp in Eaglenest Sanctuary, West Kameng.

**Notes:** 'Rare' from Sikkim to northern Myanmar (Evans 1932). Race *separata* recorded from Trashiyangtse valley, eastern Bhutan where it is sparsely seen in forested tracts between 1,700 and 1,900 m (Wangdi *et al.* 2012).

**105. Long Banded Ace *Halpe zola*** Evans, 1937

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded on 14.ix.2014 at 137 m in Deomali, Tirap on the road.

**Notes:** Reported from southern bank of Brahmaputra river in Assam, Manipur, Meghalaya (Evans 1949). Recently recorded in Panbari Reserve Forest, Dollamara, near Kaziranga-Karbi Anglong, Upper Assam (Gogoi 2013b).

**106. Light Straw Ace *Pithauria stramineipennis*** Wood-Mason & de Nicéville, 1886

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded from Daparijo, Upper Subansiri on 26.viii.2012 at 876 m and from Deomali, Tirap district on 14.ix.2014 at 127 m.

**Notes:** A specimen from Sikkim (♂: 22.v.1919) collected by O.C. Ollenbach is kept in NFIC. Previously recorded from western Manipur and Sebong in March–April (Tytler 1915). Recorded as 'not rare' from Sikkim eastwards towards Myanmar, W. China, Malay Peninsula, Borneo, Sumatra (Evans 1932). Recorded by Gogoi (2012) along the Deopani riverbed near Roing in lower Mishmi Hills, Dibang valley, Arunachal Pradesh below 1,000 m. Recorded along the Sankosh river in lowland forests of Bhutan adjoining Buxa Tiger Reserve in Winter (Singh 2012). Recorded from Jeypore-Dehing Forest, eastern Assam (Gogoi 2013a), and from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b). Recorded from Garo Hills in May, June (Sondhi *et al.* 2013) and Pakke Tiger Reserve in September (Sondhi and Kunte 2014). Recently recorded at 28 m from January to December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**107. Forest Bob *Scobura isota*** Swinhoe, 1893

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** Two individuals.

**Locality and Date of sighting:** Recorded from Namdapha Tiger Reserve, Changlang district at 317 and 331 m on 14.xii.2012 and 20.iii.2013, respectively.

**Notes:** Recorded as distributed from Sikkim to Myanmar, Malay Peninsula, Sumatra and Borneo (Evans 1932). Only one record from far east Nepal (Ilan district) at 600 m in October (Smith 1989). Also recorded from Panbari Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013a). Recorded from Pakke Tiger Reserve in April (Sondhi and Kunte 2014). Recently recorded at 28 m from January–December in Barail WLS, Cachar Hills in southern Assam (Gogoi *et al.* 2016).

**108. Spotted Red-eye *Pudicitia pholus*** de Nicéville, 1889

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded nectaring on herbaceous flowers near Mayodia Pass in Dibang valley at 2,097 m on 08.vi.2014.

**Notes:** Specimens from Bhutan (♂: 09.ix.1926) collected by O.C. Ollenbach are kept in NFIC. Recorded from Kirbari, Naga Hills at 1,800 m in August–September, 1913 (Tytler

1915). Distributed from Bhutan to Naga Hills and recorded as ‘very rare’ (Evans 1932).

**109. Yellow-fringed Swift *Caltores aurociliata*** Elwes & Edwards, 1897

**Status:** Not listed in IWPA (1972).

**Specimens recorded:** One individual.

**Locality and Date of sighting:** Recorded from Changlang district adjoining Margerita at 136 m, Assam on 06.xi.2014.

**Notes:** Recorded from Kirbari and Kohima in Naga Hills from July–September and in Kabru Peak, Manipur Hills from June to September between 1,800 and 2,400 m (Tytler 1915). Distributed from Sikkim to Manipur and recorded as ‘rare’ (Evans 1932). Also recorded from Panbari Reserve Forest and adjoining areas near Kaziranga-Karbi Anglong in upper Assam (Gogoi 2013b).

## CONCLUSION

The present study is the first attempt to assess the butterfly diversity of the entire state of Arunachal Pradesh. The total

number of species in the state is likely to be more than 750, if we take papilionid diversity to be 50+ species for Arunachal, based on the Singh and Pandey (2004) model.

The records of Ludlow’s Bhutan Swallowtail *Bhutanitis ludlowi*, Dark Black Vein *Aporia harrietae*, Glazed Oakblue *Arhopala paralela*, Great Spotted Blue *Phengaris atroguttata*, Moore’s Cupid *Shijimia moorei moorei*, Jewelled Nawab *Charaxes delphis delphis*, Pallid Forester *Lethe satyavati*, Scarce Evening Brown *Callogenes janetae loba*, Bright-eyed Argus *Callerebia dibangensis*, Scarce Blue Oakleaf *Kallima knyvettii*, Bhutan Sergeant *Athyma jina jina*, Tytler’s Sergeant *Athyma whitei*, Great Hockeystick Sailer *Phaedyas aspasia aspasia*, French Duke *Euthalia franciae rajah*, Sordid Emperor *Chitoria sordida*, Empress *Sasakia funebris funebris*, Tiger-mimic Admiral *Limenitis rileyi*, and Slate Awl *Hasora anura china* from Arunachal Pradesh, are worth mentioning as they are either new to India or the State and/or are very rare. The study suggests the need to carry out more surveys in this vast state to unravel its rich butterfly diversity, ecology, to add butterfly range extensions and new taxa.

## REFERENCES

- ANONYMOUS (2017): *Aporia harrietae* de Nicéville, 1893 – Dark Blackvein. In: Kunte, K., S. Sondhi, and P. Roy (eds). Butterflies of India. v. 2.28. Indian Foundation for Butterflies. <http://www.ifoundbutterflies.org/sp/2968/Aporia-harrietae>.
- ARORA, G.S. & D.K. MONDAL (1981): On the Papilioninae (Papilionidae: Lepidoptera) from Arunachal Pradesh and adjoining areas of Assam in North-east India. *Records of the Zoological Survey of India*. Misc. Pub., Occasional Paper no. 29. ZSI, Calcutta, pp. 65 + 7 pls.
- BASISTHA, S.K., F. AHMED & P. DEKA (1999): Butterflies of Orang Wildlife Sanctuary, Assam. *Zoo’s Print XIV*(4): 9.
- BETTS, F.N. (1950): On a collection of butterflies from the Balipara Frontier Tract and the Subansiri area (northern Assam). *J. Bombay Nat. Hist. Soc.* 49(3): 488–502.
- BHATTACHARYA, D.P. (1985): Insecta: Lepidoptera, Part I, Papilionidae. *Rec. zool. Surv. India* 82(1–4): 73–82.
- BORANG, A., B.B. BHAT, M. TAMUK, A. BORKOTOKI & J. KALITA (2008): Butterflies of Dihang Dibang Biosphere Reserve of Arunachal Pradesh, Eastern Himalayas, India. *Bulletin of Arunachal Pradesh Forest Research* 24(1&2): 41–53.
- CHOUDHURY, K. (2010): Rediscovery of two rare butterflies *Papilio elephenor* Doubleday, 1845 and *Shijimia moorei* Leech, 1889 from proposed Ripu-Chirang Wildlife Sanctuary, Assam, India. *Journal of Threatened Taxa* 2(4): 831–834.
- D’ABRERA, B. (1982): Butterflies of the Oriental Region - Part I. Papilionidae, Pieridae & Danaidae. Hill House, Victoria, Australia. 244 pp.
- D’ABRERA, B. (1985): Butterflies of the Oriental Region - Part II. Nymphalidae, Satyridae & Amathusiidae. Hill House, Victoria, Australia. 534 pp.
- D’ABRERA, B. (1986): Butterflies of the Oriental Region - Part III. Lycaenidae & Riodinidae. Hill House, Victoria, Australia. 672 pp.
- EVANS, W.H. (1914): A list of butterflies caught by Capt. F.M. Bailey in S.E. Tibet during 1913. *J. Bombay Nat. Hist. Soc.* 23(1): 532–546.
- EVANS, W.H. (1932): The Identification of Indian Butterflies. Bombay Natural History Society, Bombay. 302 pp + 32 pls.
- EVANS, W.H. (1934): Indo-Australian Hesperidae: Description of new Genera, Species and Subspecies. *Entomologist* 67(2): 33–36 (part 1), (3): 61–65 (part 2), (7): 141–151 (part 3), (8): 181–184 (part 4), (9): 206–209 (part 5), (10): 231–234 (part 6).
- EVANS, W.H. (1949): A catalogue of the Hesperidae from Europe, Asia and Australia in the British Museum (Natural History). xix + 502 pp, 53 pls. BMNH, London.
- FSI (2013): India State of Forest Report (2013). Forest Survey of India, Ministry of Environment and Forests, Govt. of India, Dehradun. 252 pp.
- GASSE, PAUL VAN (2013): Annotated checklist of the Butterflies of the Indo-Burmese region. [http://flutters.org/home/docs/Butterflies\\_Of\\_India\\_Paul\\_Van\\_Gasse.pdf](http://flutters.org/home/docs/Butterflies_Of_India_Paul_Van_Gasse.pdf)
- GOGOI, M.J. (2012): Butterflies (Lepidoptera) of Dibang Valley, Mishmi Hills, Arunachal Pradesh, India. *Journal of Threatened Taxa* 4(12): 3137–3160; <http://dx.doi.org/10.11609/JoTT.o2975.3137-60>
- GOGOI, M.J. (2013a): A preliminary checklist of butterflies recorded from Jeypore-Dehing forest, eastern Assam, India. *Journal of Threatened Taxa* 5(2): 3684–3696; <http://dx.doi.org/JoTT.o3022.3684-96>
- GOGOI, M.J. (2013b): Notes on some skipper butterflies (Lepidoptera: Hesperidae) from Panbari Forest and its adjoining areas, Kaziranga-Karbi Anglong, upper Assam, India. *Journal of Threatened Taxa* 5(13): 4759–4768; <http://dx.doi.org/10.11609/JoTT.o3340.4759-68>
- GOGOI, M.J. (2014): New records of *Athyma whitei* Tytler, 1940 (Lepidoptera: Nymphalidae: Limenitidinae) from northeastern India: a recently reported species from India. *Journal of Threatened Taxa* 6(9): 6287–6289; <http://dx.doi.org/10.11609/JoTT.o3629.6287-9>
- GOGOI, M.J., S.H. SINGHA & P. DEB (2016): Butterfly (Lepidoptera) diversity in Barail Wildlife Sanctuary, Assam, India. *Journal of Entomology and Zoology Studies* 4(4): 547–560.

- GUPTA, I.J. & J.P.N. SHUKLA (1988): Butterflies of the families Acraeidae, Satyridae, Nymphalidae, Riodinidae and Lycaenidae (Lepidoptera) from Arunachal Pradesh and adjoining areas, India. *Records of the Zoological Survey of India*. Misc Pub., Occasional Paper no. 109. ZSI, Calcutta. Pp. 114 + 23 pls.
- HARIBAL, M. (1992): The Butterflies of Sikkim Himalaya and their Natural History. Sikkim Nature Conservation Foundation, Sikkim, 217 pp.
- HUANG, H. (2003): A list of butterflies collected from Nujiang (Lou Tse Kiang) and Dulongiang, China with descriptions of new species, and revisional notes. *Neue Entomologische Nachrichten* 55: 3–114.
- INAYOSHI, Y. (2012): A Checklist of Butterflies in Indo-China (chiefly from Thailand, Laos and Vietnam). <http://yutaka.it-n.jp/lim1/720640050.html>. Accessed on November 05, 2015.
- IWPA (1972): The Wildlife Protection Act, 1972 (Amended up to 2002). Wildlife Trust of India, New Delhi, Natraj Publishers, Dehradun.
- KHANAL, B., M.K. CHALISE & G.S. SOLANKI (2013a): Population status and threat of *Phaedyra aspasia kathamandia* Fujioka 1970 (Lepidoptera: Nymphalidae), an endemic subspecies of butterfly in Godavari forest of Central Nepal. *J. Nat. Hist. Mus.* 27: 87–91.
- KHANAL, B., M.K. CHALISE & G.S. SOLANKI (2013b): Threatened butterflies of central Nepal. *Journal of Threatened Taxa* 5(11): 4612–4615; <http://dx.doi.org/10.11609/JoTT.o2825.4612-5>
- KEHIMKAR, I. (2008): The Book of Indian Butterflies. Bombay Natural History Society, Oxford University Press, Mumbai. 497 pp.
- LANG, S.Y. & H. HUANG (2012): A new subspecies of the Genus *Cyllogenes* Butler, 1868 from SE. Tibet (Lepidoptera, Nymphalidae). *Atalanta* 43(3/4): 509–511.
- LODH, R. & B.K. AGARWALA (2015): Inventory of butterfly fauna (Lepidoptera: Rhopalocera) of Tripura, India, in the Indo-Myanmar biogeographical zone, with records of threatened taxa. *Check List* 11(2): 1–37; <http://dx.doi.org/10.15560/11.2.1591>
- MANI, M.S. (1986): Butterflies of the Himalaya. Oxford and IBH Publishing Co. Ltd. 181 pp.
- MONASTYRSKII, A.L. & A.L. DEVYATKIN (2000): New taxa and new records of butterflies from Vietnam. *Atalanta* 31(3/4): 471–492.
- PARSONS, R.E. & K. CANTLIE (1948): The butterflies of the Khasia and Jaintia hills, Assam. *J. Bombay Nat. Hist. Soc.* 47(2): 498–522.
- ROY, P. (2013): *Callerebia dibangensis* (Lepidoptera: Nymphalidae: Satyrinae), a new butterfly species from the eastern Himalaya, India. *Journal of Threatened Taxa* 5(13): 4725–4733. <http://dx.doi.org/10.11609/JoTT.o3293.4725-33>
- SBORDONI, V., G.C. BOZANO, K. WANGDI, S. SHERUB, S. MARTA, S. DE FELICI & D. CESARONI (2015): Towards a georeferenced checklist of the butterflies of Bhutan: a preliminary account (Insecta: Lepidoptera). Pp. 523–546, pl. I–VI. In: Hartmann, M. & J. Weipert (Eds): Biodiversity and natural heritage of the Himalaya V. Verein der Freunde und Foerder des Naturkundemuseums Erfurt e.V. Erfurt, Germany.
- SENGUPTA, P., K.K. BANERJEE & N. GHORAI (2014): Seasonal diversity of butterflies and their larval food plants in the surroundings of Neora Valley National Park, a sub-tropical broad leaved hill forest in the eastern Himalayan landscape, West Bengal, India. *Journal of Threatened Taxa* 6(1): 5326–5342. <http://dx.doi.org/10.11609/JoTT.o3446.5327-42>
- SHIZUYA, H., Y. WATANABE, M. SAITO, T. SOE & H. OZAWA (2011): Basic information on butterflies of Kachin State, Myanmar (Part 5). *Journal of Butterflies (Teinopalpus)* 57: 11–26.
- SINGH, A.P. (2006): Range extension of Brown Gorgon butterfly, *Meandrusa gyas gyas* into Kedarnath Musk Deer Reserve, Western Himalayas : A lesser known species from north-east India. *Indian Forester* 132(12a): 187–189.
- SINGH, A.P. (2011): Butterflies of India. Om Books International. 183 pp.
- SINGH, A.P. (2012): Lowland forest butterflies of the Sankosh River catchment, Bhutan. *Journal of Threatened Taxa* 4(12): 3085–3102. <http://dx.doi.org/10.11609/JoTT.o2625.3085-102>.
- SINGH, A.P. (2013): Rediscovery of the Empress, *Sasakia funebris* Leech (Lepidoptera: Nymphalidae: Nymphalinae: Apaturini) after 88 years in India. *Journal of Threatened Taxa* 5(10): 4514–4516. <http://dx.doi.org/10.11609/JoTT.o3428.4514-6>
- SINGH, A.P. (2015): On the female morphs, ecology and male genitalia of *Callerebia dibangensis* Roy (Lepidoptera: Nymphalidae: Satyrinae) recorded near Mayodia Pass in lower Dibang Valley, Arunachal Pradesh, India. *Journal of Threatened Taxa* 7(5): 7168–7174. <http://dx.doi.org/10.11609/JoTT.o4035.7168-74>.
- SINGH, A.P. (2016): Moist temperate forest butterflies of western Bhutan. *Journal of Threatened Taxa* 8(3): 8596–8601. <http://dx.doi.org/10.11609/jot.2297.8.3.8596-8601>
- SINGH, I.J. & M. CHIB (2014): A preliminary checklist of butterflies (Lepidoptera: Rhopalocera) of Mendrelgang, Tsirang District, Bhutan. *Journal of Threatened Taxa* 6(5): 5755–5768. <http://dx.doi.org/10.11609/JoTT.o3675.5755-68>
- SINGH, A.P. & R. PANDEY (2004): A model for estimating butterfly species richness of areas across the Indian sub-continent: species proportion of family Papilionidae as an indicator. *J. Bombay Nat. Hist. Soc.* 101(1): 79–89.
- SINGH, A.P., L. GOGOI & J. SEBASTIAN (2015): The seasonality of butterflies in a semi-evergreen forest: Gibbon Wildlife Sanctuary, Assam, northeastern India. *Journal of Threatened Taxa* 7(1): 6774–6787. <http://dx.doi.org/10.11609/JoTT.o3742.6774-87>
- SMITH, C. (1989): Butterflies of Nepal (Central Himalaya). Craftsman Press, Bangkok. 352 pp.
- SMITH, C. (2006): Illustrated Checklist of Nepal's Butterflies. Craftsman Press, Bangkok. 129 pp.
- SONDHI, S. & K. KUNTE (2014): Butterflies and Moths of Pakke Tiger Reserve. Title Trust (Dehradun), and Indian Foundation for Butterflies (Bengaluru). vi+202 pp.
- SONDHI, S., K. KUNTE, G. AGAVEKAR, R. LOVALEKAR & K. TOKEKAR (2013): Butterflies of the Garo Hills. Samrakshan Trust (New Delhi), Titli Trust (Dehradun), and Indian Foundation for Butterflies (Bengaluru), xvi+200 pp.
- TYTLER, H.C. (1915): Notes on some new and interesting butterflies from Manipur and Naga Hills. *J. Bombay Nat. Hist. Soc.* 23: 502–515 + 4 pls.
- VAN DER POEL, P. & T. WANGCHUK (2007): Butterflies of Bhutan. Mountains, hills and valleys between 800 and 3000 m. Royal Society for Protection of Nature (RSPN), Thimphu, Bhutan. 71 pp.
- WANGDI, S., K. WANGDI, SHERUB, R. WANGDI, S. DRUKPA, M. HARADA, T. AOKI, S. YAMAGUCHI, M. SAITO, Y. IGARASHI, Y. WATANABE & M. YAGO (2012): Butterflies of Trashiyangtse Valley, eastern Bhutan (Part 1). *Butterflies (Teinopalpus)*. 62: 16–28.
- WANGDI, S., K. WANGDI, SHERUB, R. WANGDI, S. DRUKPA, M. HARADA, T. AOKI, S. YAMAGUCHI, M. SAITO, Y. IGARASHI, Y. WATANABE & M. YAGO (2013): Butterflies of Trashiyangtse Valley, eastern Bhutan (Part 2). *Butterflies (Teinopalpus)*. 64: 4–15.
- WOOD-MASON, J. & L. DE NICEVILLE (1886): List of the lepidopterous insects collected in Cachar by Mr. J. Wood-Mason, Part II, Rhopalocera. *Journal of the Asiatic Society of Bengal, Calcutta*. Plates XV–XVIII. Pp. 344–393.
- WYNTER-BLYTH, M.A. (1957): Butterflies of the Indian Region. Bombay Natural History Society, Bombay. 523 pp.



## MISCELLANEOUS NOTES

1. INDIAN ROUNDEAF BAT *HIPPOSIDEROS LANKADIVA*:  
FIRST RECORD FOR BANGLADESHANIK SAHA<sup>1,2</sup>, MOHAMMED MOSTAFA FEEROZ<sup>1,3</sup> AND MD KAMRUL HASAN<sup>1,4,\*</sup><sup>1</sup>Department of Zoology, Jahangirnagar University, Savar, Dhaka 1342, Bangladesh.<sup>2</sup>Email: aniksaha0090@gmail.com<sup>3</sup>Email: feerozmm@yahoo.com<sup>4</sup>Email: mkhasan@ucdavis.edu

\*Corresponding author

doi: 10.17087/jbnhs/2015/v112i3/114422

Bangladesh is a transitional zone for the flora and fauna of the Indian Subcontinent and of Southeast Asia (Stanford 1991). It supports diverse species of wild animals in different types of habitats ranging across mixed-evergreen hill forests, mangroves, homestead vegetations, wetlands, and floodplains (Ahmed *et al.* 2009; Khan 2008; Khan 2015). 128 species of mammals including 34 species of bats are recorded to occur in Bangladesh, though many of the bat species are of doubtful occurrence in the country (Ahmed *et al.* 2009; Khan 2008, 2014; Khan 2001, 2015). Recently, the Indian Roundleaf Bat *Hipposideros lankadiva* was recorded from northern Bangladesh. Previous reports of its existence in Bangladesh are not confirmed (Ahmed *et al.* 2009; Khan 2008; Khan 1982, 2001, 2010, 2015; Srinivasulu *et al.* 2010). This note with photographic evidence confirms the occurrence of *Hipposideros lankadiva* in Bangladesh.

A roost of *Hipposideros lankadiva* was recorded for the first time in an old abandoned temple at Netrokona (24° 57' 21.42" N; 90° 31' 43.43" E) on September 27, 2015. Netrokona is situated in the northern part of Bangladesh, very close to the Meghalaya hill range of India. The temple is about 400 years old and has been abandoned for at least 100 years. Most of the temple complex has been destroyed but a single room where the bats are residing still exists. The locals have some beliefs and myths about the temple and they usually avoid entering the temple premises. The temple complex is covered with bushes and lianas, making it an undisturbed roosting site for a large number of bats.

The roosting colony comprised 450–500 individuals of *H. lankadiva* and no other species of bats were found along with this colony (Figs 1 and 2). Two individuals (one male and one female) were captured using mist net and released at the same site after taking morphometric measurements.

*H. lankadiva* is a large leaf-nosed bat having four supplementary leaflets on the nose-leaf with the 4th leaflet reduced, which is a key character of the species (Fig. 1). The upper margin of the posterior nose-leaf is thick and

crown-shaped, having two lateral convexities (Fig. 1). The pelage of this bat is yellowish brown and darker on the head and shoulders, while it is comparatively paler on the belly (Fig. 1). The head body length and forearm were measured as 98.1±4.24 mm and 87.64±3.62 mm respectively. The ear measured 27.06±2.05 mm, hind feet 19.35±1.0 mm, tibia length 35.55±2.48 mm, tail 51.45±2.34 mm, third metacarpal 67.71±0.79 mm, 1st phalanx of third metacarpal 31.63±1.17 mm, 2nd phalanx of third metacarpal 34.34±1.23 mm, and nose-leaf measured 11.17±0.09 mm.

*Hipposideros lankadiva* is differentiated from other leaf-nosed bat species such as *H. armiger* which have a fleshy elevation behind the posterior nose-leaf (Bates and



Fig. 1: Indian Roundleaf Bat *Hipposideros lankadiva* photographed on September 27, 2015, in Netrokona, northern Bangladesh (Photo: Anik Saha)

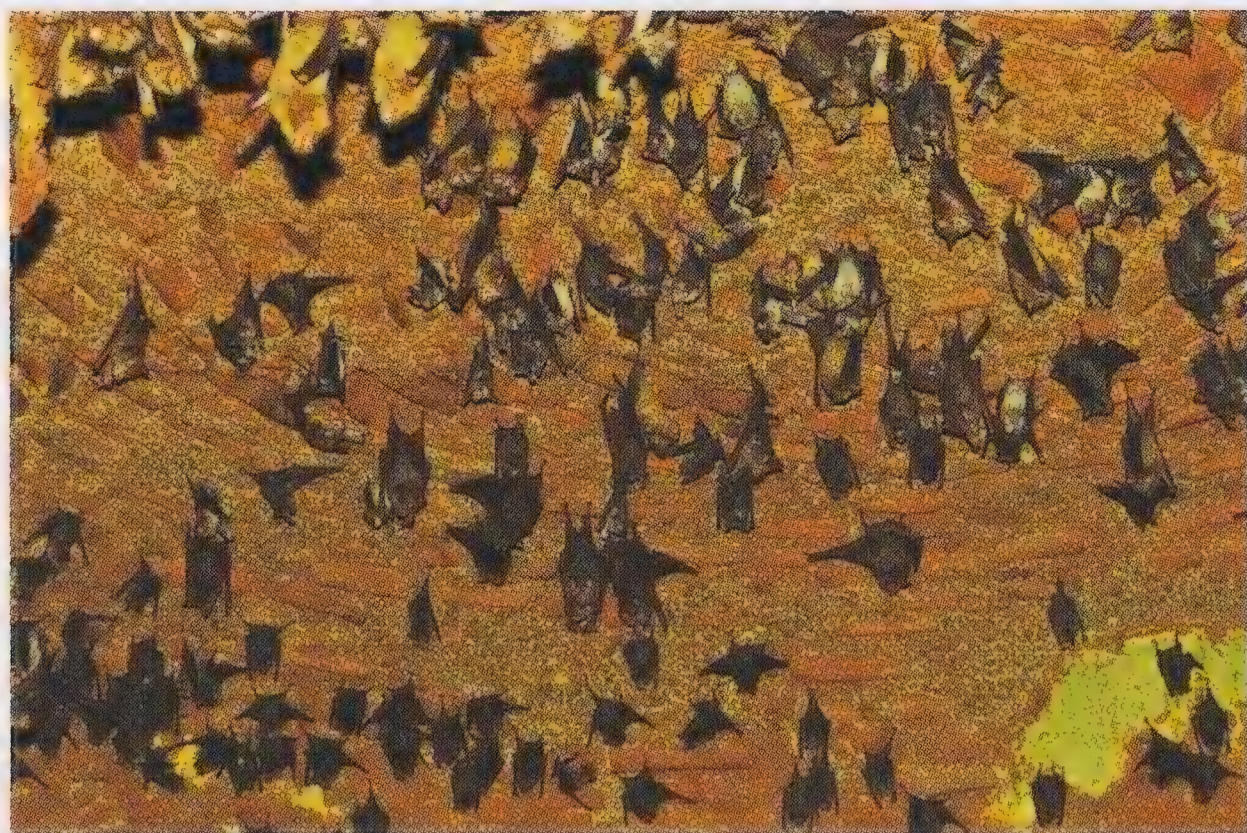


Fig. 2: Colony of Indian Roundleaf Bat *Hipposideros lankadiva* photographed on September 27, 2015, in the temple in Netrakona, northern Bangladesh (Photo: Anik Saha)

Harrison 1997). While the similar species *H. diadema* has white patches on the shoulder, such patches are absent in *H. lankadiva*, and *H. larvatus* is comparatively smaller in size, with three supplementary leaflets (Francis 2008).

*H. lankadiva* is endemic to South Asia and known from most parts of India including Meghalaya Hill Range, Sri Lanka and from Myanmar (Bates *et al.* 2015; Molur *et al.* 2008). The occurrence of this species in Bangladesh was doubtful, as Khan (2001) included it in the checklist of bats of Bangladesh, but later excluded it (Khan 2015).

The nearest reported population of *H. lankadiva* is in Meghalaya, India (Kurup 1968), which is only 15 km from the present site (Netrokona). Apparently no threats to the roost of this species were observed. Future study can be focused on the status and ecology of this species.

## REFERENCES

- AHMED, A.T.A., S.M.H. KABIR, M. AHMAD, Z.U. AHMED, Z.N.T. BEGUM, M.A. HASSAN & M. KHONDKER (Eds) (2009): Encyclopedia of Flora and Fauna of Bangladesh. Vol. 27: Mammals. Asiatic Society of Bangladesh, Dhaka, Bangladesh. 264 pp.
- BATES, P., O. TUN, M.M. AUNG, A. LU, M.R. LUM & M.M. SEIN (2015): A review of *Hipposideros lankadiva* Kelaart, 1850 (Chiroptera: Hipposideridae) with a description of a new subspecies from Myanmar. *Tropical Natural History* 15(2): 191–204.
- BATES, P.J.J. & D.L. HARRISON (1997): Bats of the Indian Subcontinent. Harrison Zoological Museum, Kent, UK. 258 pp.
- FRANCIS, C.M. (2008): A Field Guide to the Mammals of South-East Asia. New Holland Publishers Ltd., London, UK. 392 pp.
- KHAN, M.A.R. (1982): Wildlife of Bangladesh – A checklist. Dhaka University, Dhaka, Bangladesh. 174 pp.
- KHAN, M.A.R. (2001): Status and distribution of bats in Bangladesh with notes on their ecology. *Zoos' Print Journal* 16(5): 479–483.
- KHAN, M.A.R. (2010): Wildlife of Bangladesh from Amphibia to Mammalia – A Checklist. Shahitya Prakash, Dhaka, Bangladesh. 128 pp.
- KHAN, M.A.R. (2015): Wildlife of Bangladesh checklist and guide. Chyabithi, Dhaka, Bangladesh. 568 pp.
- KHAN, M.M.H. (2008): Protected Areas of Bangladesh – A Guide to Wildlife. Nishorgo Program, Bangladesh Forest Department, Dhaka, Bangladesh. 304 pp.
- KHAN, M.M.H. (2014): Introduction to the wildlife of Bangladesh. SRCWP. Jahangirnagar University and Bangladesh Forest Department, Dhaka, Bangladesh.
- KURUP, G.U. (1968): Mammals of Assam and adjoining areas. *Proceedings of the Zoological Society, Calcutta* 21: 79–99.
- MOLUR, S., W. YAPA & C. SRINIVASULU (2008): *Hipposideros lankadiva*. The IUCN Red List of Threatened Species 2008:e.T10142A3173448. <http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T10142A3173448.en>. Downloaded on February 06, 2016.
- SRINIVASULU, C., P.A. RACEY & S. MISTRY (2010): A key to the bats (Mammalia: Chiroptera) of South Asia. *Journal of Threatened Taxa* 2(7): 1001–1076.
- STANFORD, C.B. (1991): The Capped Langur in Bangladesh: Behavioural Ecology and Reproductive Tactics. Vol. 26. Karger Publishers, Basel, Switzerland.

## 2. NOTE ON THE JUNGLE BUSH-QUAIL *PERDICULA ASIATICA* IN KERALA, SOUTHWEST INDIA: MUSEUM RECORDS

V.J. ZACHARIAS<sup>1,\*</sup> AND KRISTOF ZYSKOWSKI<sup>2</sup>

<sup>1</sup>24657 Byrne Meadow Sq., Aldie, VA 20105, USA. Email: vjzacharias@yahoo.co.uk

<sup>2</sup>Division of Vertebrate Zoology, Yale University, Peabody Museum of Natural History, 170 Whitney Ave, New Haven, CT 06511, USA. Email: kristof.zyskowski@yale.edu

\*Corresponding author

doi: 10.17087/jbnhs/2015/v112i3/114423

### Introduction

The Jungle Bush-Quail *Perdicula asiatica* and the Rock Bush-Quail *P. argoondah* are endemic to the Indian subcontinent, the former having a wide distribution south of the Himalaya, and the latter, a restricted distribution in the peninsula (Rasmussen and Anderton 2012). In all

publications on the birds of Kerala, the two species are put together (Ali 1999; Ali and Whistler 1937; Baker and Inglis 1930; Sasikumar *et al.* 2011). Whistler and Kinnear (1936) mention the challenge in identifying the Jungle Bush-Quail. Though Ali and Whistler (1937) observed the species at Wadakkancherry and Chalakudy during their Travancore-

Cochin Ornithological survey, Ali (1999) believed it impossible to distinguish *P. argoondah* with certainty in the field. This note reports the occurrence of *Perdicula asiatica* in Thrissur, Kerala, based on museum records.

### Jungle Bush-Quail *Perdicula asiatica*

Occurs in grass and scrub jungle or in dry open forests. In southern India, this type of habitat is found mostly in the rain shadow region of the Western Ghats, in south-eastern Wayanad, Palakkad, Chinnar, and Aryankavu Pass. The low elevation areas of Kerala, including Palakkad district, have open scrub type jungles. The Jungle Bush-Quail was reported from south-eastern Wayanad by Fletcher (1911). Whistler and Kinnear (1936) did not believe that the species occurred in Travancore (southern Kerala), except possibly in the dry area around Kanyakumari [=Cape Comorin]. According to Whistler and Kinnear (1936) the Jungle Bush-Quail occurred mostly in the rain shadow regions of the Western Ghats, in Tamil Nadu and Karnataka in the more open dry scrub areas, and in smaller numbers in northern and southern Kerala in suitable habitats. Whistler and Kinnear (1936) and Abdulali and Reuben (1964) reported the presence of a specimen from Malappuram in the Natural History Museum, London (NHMUK).

Yale Peabody Museum (YPM) has four specimens of Jungle Bush-Quail (Ripley collection) from Ollukkara, Thrissur, Kerala at 10.52° N and 76.27° E collected by N.G. Pillai (Table 1).

This proves that the current population (e-Bird [2016]) around Thrissur has been in existence for at least half a century. The Malappuram specimen in the NHMUK mentioned by Whistler and Kinnear (1936) and Abdulali and Reuben (1964) could not be located (Hein Van Grouw, in email August 01, 2016).

### Rock Bush-Quail *Perdicula argoondah*

Occurs in dry, stony, thorn scrub, mostly below 600 m. This type of habitat occurs at Chinnar in Kerala, but mostly in Tamil Nadu and Karnataka, in southern India, in the

**Table 1:** *Perdicula asiatica* specimens collected from Ollukkara, Thrissur, Kerala

S. No.	Museum	Reg. No.	Sex	Date of collection	Collector
1	YPM	24630	Male	April 22, 1952	N.G. Pillai
2	YPM	24631	Male	October 16, 1951	N.G. Pillai
3	YPM	24632	Male	October 13, 1951	N.G. Pillai
4	YPM	24633	Female	October 13, 1951	N.G. Pillai

rain shadow region of the Western Ghats or in the Deccan plateau. There is a single specimen in the BNHS Collection, collected by J.P. Cook, which reads ‘Wynaad, Travancore’, labelled as subspecies *salimalii*. The locality of collection here appears quite doubtful and the specimen could be of extra-regional origin. Whistler and Kinnear (1936) stated that the Rock Bush-Quail has a restricted distribution and quoted Hume and Marshall (Game Birds ii, p.117), saying “the species occurs on the eastern side of the peninsula down to the extreme south and in all other eastern Madras districts and even near Coimbatore”. Whistler and Kinnear (1936) mentioned a specimen collected from Coimbatore in the NHMUK, and believed that the species has a restricted distribution in the peninsula. The Rock Bush-Quail seems to be specific to dry thorn scrub country, a type of habitat not found much in Kerala.

### Conclusion

Our findings confirm the extension of the known range of subspecies *vidali* of Jungle Bush-Quail in Kerala up to Thrissur. This species has a restricted distribution in open scrub country in the state. The four specimens collected from Ollukkara, Thrissur in YPM show that a fairly good population of *Perdicula asiatica* existed in the area even in 1950s.

### ACKNOWLEDGEMENT

We thank Hein Van Grouw of the NHMUK for information on the Malappuram specimen of *Perdicula asiatica* in the museum.

### REFERENCES

- ABDULALI, H. & R. REUBEN (1964): The Jungle Bush-quail *Perdicula asiatica* (Latham) a new race from South India. *J. Bombay Nat. Hist. Soc.* 61(3): 688–691.
- ALI, S. (1999): Birds of Kerala. Revised by R. Sugathan. Kerala Forest Department, Thiruvananthapuram. Pp. 520.
- ALI, S. & H. WHISTLER (1937): The Ornithology of Travancore and Cochin. *J. Bombay Nat. Hist. Soc.* 39(3): 569–593.
- BAKER, H.R. & C.M. INGLIS (1930): Birds of Southern India including Madras, Malabar, Travancore, Cochin, Coorg and Mysore. Government Press, Madras. 504 pp.
- E-BIRD (2016): eBird: An online database of bird distribution and abundance [web application] eBird, Ithaca, New York. Available at <http://www.eBird.org>. Accessed on August 05, 2016.
- FLETCHER, F.W.F. (1911): Sport on the Nilgiris and Wynaad. Macmillan & Co Ltd., London.
- RASMUSSEN, P.C. & J.C. ANDERTON (2012): Birds of South Asia. The Ripley Guide. Vols 1 and 2. 2nd edn. National Museum of Natural History – Smithsonian Institution, Washington DC, Michigan State University, Michigan, and Lynx Edicions, Barcelona, Spain.
- SASIKUMAR, C., J. PRAVEEN, MOHAMED JAFER PALOT & P.O. NAMEER (2011): Birds of Kerala, Status and Distribution. D.C. Books, Kottayam.
- WHISTLER, H. & N.B. KINNEAR (1936): The Vernay Scientific Survey of the Eastern Ghats. *J. Bombay Nat. Hist. Soc.* 38(4): 672–698.

### 3. FIRST SIGHTING OF LAUGHING DOVE *STREPTOPELIA SENEGALENSIS* IN KARGIL DISTRICT OF LADAKH, INDIAN TRANS-HIMALAYA

TANVEER AHMED<sup>1,3,\*</sup> AFIFULLAH KHAN<sup>1,4</sup> AND PANKAJ CHANDAN<sup>2</sup>

<sup>1</sup>Department of Wildlife Sciences, Aligarh Muslim University, Aligarh 202 002, Uttar Pradesh, India.

<sup>2</sup>WWF-India, 172-B, Lodhi Estate, New Delhi 110 003, India. Email: pchandana@wwfindia.net

<sup>3</sup>Email: tanveerwildlife@gmail.com

<sup>4</sup>Email: afifullah.khan@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114424

The family Columbidae, represented by doves and pigeons, is distributed in almost all biogeographic regions of the world (Gibbs *et al.* 2001). The distributional range of Laughing Dove *Streptopelia senegalensis* includes Arabia, Iran, Kazakhstan, China, Pakistan, India, and Bangladesh. Five subspecies of Laughing Dove are known to occur, i.e., *S. s. phoenicophila* (Hartert 1916) in Morocco, Algeria, and Tunisia; *S. s. aegyptiaca* (Latham 1790) in the Nile valley; *S. s. sokotrae* (Grant 1914) in Socotra; *S. s. senegalensis* (Linnaeus 1766) in Sub-Saharan Africa and west Arabia; and *S. s. cambayensis* (Gmelin 1789) in Arabia, Iran, and some south Asian countries (del Hoyo *et al.* 1997).

The subspecies *Streptopelia senegalensis cambayensis* (Gmelin 1789) occurs throughout the Indian subcontinent except parts of the Himalaya, north-east India, and Sri Lanka (Grimmett *et al.* 1999). In Himalaya, the presence of the species was reported up to a height of 1,000 m only (Ali and Ripley 1981). However, Pfister (2001) recorded its occurrence at an elevation of 4,350 m, which is the highest till date. The species is categorized as a Schedule IV species under the Indian Wildlife (Protection) Act, 1972 as well as the Jammu & Kashmir Wildlife (Protection) Act, 1978, and is listed as Least Concern according to IUCN Red Data list (IUCN 2014).

During an avifaunal survey in Rangdum valley, we sighted this species on July 05, 2012 between 14:30 and 15:00 hrs on the fence of Zuildo Guest House (34° 03' 21" N; 76° 19' 26" E), Zuildo, Kargil, at an elevation of 4,016 m. The bird was immediately recognized as Laughing Dove *Streptopelia senegalensis*, by its pinkish brown colour with dull brownish purple head and neck. The upper back and upper wings of the bird were mottled reddish brown and grey. The lower portion of the wings and the lower back were bluish grey. The purplish brown colour on the breast was merging into white on the belly. The region just below the throat was reddish brown, speckled black. The bird had dark brown iris and purplish pink legs.

It was sighted again on July 12, 2012 at Zuildo Gompa, feeding outside the gompa. Zuildo Gompa is situated in a

valley about four km long and two km wide surrounded by rugged, barren mountains with ice-covered peaks and slopes. Numerous small streams crisscrossing the valley join the main stream flowing north-south along the western periphery of the valley. This gives rise to marshy vegetation along the main stream. Except for a few patches of herbaceous meadows, the valley floor is dry and barren. There are permanent human settlements at some distance from the gompa. The bird was observed in barren land near human settlements during both the sightings.

Although several avifaunal surveys have been conducted in Kargil district, no one had documented the presence of this species from Kargil district, to the best of our knowledge. For instance, Holmes (1986) reported 128 species from Suru valley but did not report the presence of this species. More importantly, it was not reported from Wakkha Nallah, Suru valley and Zaskar region of Kargil district (Singh and Jayapal 2000). However, the rare presence of Laughing Dove has been reported from Leh district (Mallon 1987; Pfister 2001). Pfister (2004) describes it as a "rare passage migrant during late autumn in the lower valleys and plains mainly of central Ladakh". Hence, the present communication is important, being the first record of Laughing Dove from Kargil district in Jammu & Kashmir. The nearest earlier record of the species (Pfister 2004) happens to be from Nimu village in Leh district, which is about 200 km south-east of the present recorded site.

#### ACKNOWLEDGEMENTS

We are grateful to WWF-India for providing infrastructural support which facilitated our field work. Our special thanks to Mr. Ravi Singh, Secretary General & CEO, WWF-India and Dr. Sejal Worah, Programme Director, WWF-India for their support and encouragement to work in Ladakh. Thanks are due to Mr. Jigmet Takpa, CCF & Regional Wildlife Warden, Ladakh and Mr. Abdul Rauf, Wildlife Warden, Department of Wildlife Protection, Leh for granting permission to work in the area.

## REFERENCES

- ALI, S. & S.D. RIPLEY (1981): Handbook of the Birds of India and Pakistan. Vol. 3, Stone Curlew to Owls. Oxford University Press, Delhi. Pp. 155,
- DEL HOYO, J., A. ELLIOTT & J. SARGATAL (Eds) (1997): Handbook of the Birds of the World. Vol. 4, Sandgrouse to Cuckoos. 679 pp. Lynx Edicions, Barcelona, Spain.
- GIBBS, D., E. BARNES & J. COX (2001): Pigeons and Doves: A Guide to the Pigeons and Doves of the World. Pica Press, Sussex. 615 pp.
- GRIMMETT, R., C. INSKIPP & T. INSKIPP (1999): Birds of the Indian Subcontinent. Oxford University Press, Mumbai. 528 pp.
- HOLMES, P.R. (1986): Avifauna of the Suru river valley, Ladakh. *Forktail* 2: 21-41.
- IUCN (2014): IUCN Red List of Threatened Species. Version 2014.1. <www.iucnredlist.org>. Downloaded on February 01, 2014.
- MALLON, D.P. (1987): Winter birds of Ladakh. *Forktail* 3: 27-41.
- PFISTER, O. (2001): Birds recorded during visits to Ladakh, India from 1994 to 1997. *Forktail* 17: 81-90.
- PFISTER, O. (2004): Birds & Mammals of Ladakh. Oxford University Press, New Delhi. Pp. 39-40.
- SINGH, P. & R. JAYAPAL (2000): A Survey of Breeding Birds of Ladakh. Pp. 74-107. In: Conserving Biodiversity in the Trans-Himalaya: New Initiatives of Field Conservation in Ladakh. Wildlife Institute of India, Dehradun.

#### 4. CEYLON FROGMOUTH *BATRACHOSTOMUS MONILIGER* BLYTH IN THE HIGH WAVY MOUNTAINS, TAMIL NADU, SOUTHERN INDIA

V.J. ZACHARIAS<sup>1,\*</sup> AND B.M. BEEHLER<sup>2</sup>

<sup>1</sup>24657 Byrne Meadow Sq., Aldie, VA 20105, USA. Email: vjzacharias@yahoo.co.uk

<sup>2</sup>National Museum of Natural History, P.O. Box 37012, Smithsonian Institution, Washington, DC 20013, USA.

Email: brucebeehler@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114425

The Ceylon Frogmouth *Batrachostomus moniliger* is endemic to the southern Western Ghats and Sri Lanka. It occurs in dense humid primary and secondary forests and thick bamboo jungles (Rasmussen and Anderton 2005). The species has received much attention in southern India in recent years because of its appearance and habits, and is a tourist attraction in the Thattekkad Bird Sanctuary, Kerala. It is common in the Western Ghats from North Kanara through the south, including Wayanad (Whistler and Kinnear 1935). This frogmouth, though once considered rare, probably because of its nocturnal habits, is now believed to be common, having a wide distribution in Kerala, mostly in protected areas.

There are sight records of the species from the Kerala part of the Ghats in Wayanad, Parambikulam, Thattekkad, and Periyar (Gaston and Zacharias 1996; Sugathan 1981) and specimens collected from southern Kerala are available in the British Museum and Bombay Natural History Society (Abdulali 1972; Ali and Whistler 1936). On the drier eastern side of the Western Ghats in Tamil Nadu, it has been reported only from the Anamalais (Kannan 1994), and none from further south. Joshua and Johnsingh (1988), who studied the bird fauna of Kalakkad-Mundanthurai, southern Western Ghats in Tamil Nadu, did not report the Ceylon Frogmouth.

There are two specimens of the Ceylon Frogmouth in the National Museum of Natural History, Washington, DC

(USNM 585464 - male, USNM 585465 - female) collected by the second author on February 24, 1986, from Vannathiparai, at 9°35' N and 77°15' E in the foothills of the High Wavy Mountains. The male specimen weighed 46.5 gm and the female 59.0 gm. Measurements show that the male is smaller than the female (Abdulali 1972; Ali and Whistler 1936).

The single field observation of the species made by the second author was of a rufous morph individual perched 2.5 m up in a small mango tree at the edge of a clearing. Attention was drawn to the frogmouth because it was being mobbed by songbirds. It is also notable that the vegetation at Vannathiparai is dry deciduous, and all other records of the species come from evergreen or moist deciduous forest. The female specimen had one developed egg and was hence breeding (notes from Beehler). Whistler and Kinnear (1935) believed that the species breeds from January to April, though odd eggs were found from June to September. A female specimen collected from Thattekkad in the beginning of February was breeding (Ali and Whistler 1936). Zacharias and Gaston (1993) found a nest of the species with one chick at Thirunelly in Wayanad at about 1,200 m, in March 1986.

Thus, this constitutes the first record of the Ceylon Frogmouth at the southernmost end of the eastern side of the Western Ghats, in the dry deciduous forests in the foothills of the High Wavy Mountains, Tamil Nadu. In addition, the substantial difference in weights of the male and female indicate there may be sexual dimorphism in the species,

which has not been reported so far. The Ceylon Frogmouth seems to complete its breeding activity before the arrival of the southwest monsoon, like other insectivorous birds in southern India (Gaston *et al.* 1986; Zacharias and Gaston 1983).

## ACKNOWLEDGEMENTS

The first author thanks James Dean and Gary Graves for their help in the NMNH, Smithsonian Institution, and Martha Rosen for her help in the Natural History Library.

## REFERENCES

- ABDULALI, H. (1972): A catalogue of the birds in the collection of the Bombay Natural History Society. *J. Bombay Nat. Hist. Soc.* 69(1): 102–129.
- ALI, S. & H. WHISTLER (1936): The ornithology of Travancore and Cochin. *J. Bombay Nat. Hist. Soc.* 39(1): 3–35.
- GASTON, A.J. & V.J. ZACHARIAS (1996): The recent distribution of endemic and disjunct birds in Kerala state: Preliminary results of an ongoing survey. *J. Bombay Nat. Hist. Soc.* 93(3): 389–400.
- GASTON, A.J., S. CHATTOPADHYAY, V.S. VIJAYAN & V.J. ZACHARIAS (1986): Seasonal cycle of Indian insectivorous birds. *Proc. XIX Congressus Internationalis Ornithologicus*, Ottawa, Canada. June 22–29, 1986.
- JOSHUA, J. & A.J.T. JOHNSINGH (1988): Observations on birds on Mundanthurai Plateau, Tamil Nadu. *J. Bombay Nat. Hist. Soc.* 85(3): 565–577.
- KANNAN, R. (1994): Notes on the status and ecology of the Ceylon Frogmouth (*Batrachostomus moniliger* Blyth) from the Anaimalai hills of Tamil Nadu. *J. Bombay Nat. Hist. Soc.* 91(3): 454–455.
- RASMUSSEN, P.C. & J.C. ANDERTON (2005): Birds of South Asia. The Ripley Guide. 2 vols. Smithsonian Institution, Washington, DC and Lynx Edicions, Barcelona.
- SUGATHAN, R. (1981): A survey of the Ceylon Frogmouth *Batrachostomus moniliger* Blyth habitats in the Western Ghats of India. *J. Bombay Nat. Hist. Soc.* 78(3): 309–315.
- WHISTLER, H. & N.B. KINNEAR (1935): The Vernay Scientific Survey of the Eastern Ghats. *J. Bombay Nat. Hist. Soc.* 38(1): 26–40.
- ZACHARIAS, V.J. & A.J. GASTON (1983): Breeding seasons of birds at Calicut, Southwest India. *Ibis* 124: 407–412.
- ZACHARIAS, V.J. & A.J. GASTON (1993): Birds of Wynad, southern India. *Forktail* 8: 11–23.

## 5. WHITE-CAPPED RIVER-CHAT *PHOENICURUS LEUCOCEPHALUS* IN ODISHA: FIRST RECORD FROM PENINSULAR INDIA

ASIF N. KHAN<sup>1,2,\*</sup> AND RAHUL KHOT<sup>1,3</sup>

<sup>1</sup>Bombay Natural History Society, Hornbill House, Dr. Salim Ali Chowk, Shaheed Bhagat Singh Road, Mumbai 400 001, Maharashtra, India.

<sup>2</sup>Email: a.khan@bnhs.org, khanasif36@gmail.com

<sup>3</sup>Email: r.khot@bnhs.org, rahul.bnhs@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v112i3/114426

The White-capped River-Chat or White-capped Water-Redstart *Phoenicurus leucocephalus* has an extensive global range, from Uzbekistan through the Tibetan Plateau to China (BirdLife International 2016). Within the Indian subcontinent, it is a common altitudinal migrant in the Himalaya. In summer, it occurs in the entire Himalaya, the hills of the Northeast, and Chittagong, Bangladesh (Manakadan *et al.* 2011) between 1,200 and 4,300 m (Rasmussen and Anderton 2012), and winters (September to April) mostly below 1,500 m but up to 2,500 m (Ali and Ripley 1998; Rasmussen and Anderton 2012). It breeds along large rapid mountain streams, and winters along clear rivers and canals from lowlands to foothills (del Hoyo *et al.* 2005).

In January 2016, while birding at Khandadhar Falls (21° 46' 27.02" N; 85° 19' 20.44" E; 700 m above msl), Keonjhar (Kendujhar) district in northern Odisha, the first author spotted a black bird with a white cap flitting on the rocks

along the waterfall. It later settled for some time on a rock beside a pool, during which he observed it clearly with 10x42 binoculars and also filmed it with a mobile phone. The bird was identified as a White-capped River-Chat with the help of Rasmussen and Anderton (2012).

The only species with which it can be confused is the male of the White-winged Redstart *Phoenicurus erythrogastrus* which is again distributed in the Himalaya and the hills of the north-east region. However, the bird sighted lacked the white patch on the wing seen in the White-winged, and also had a broad black terminal band on the tail, which is absent in the White-winged. This is the first record of the species from the Indian Peninsula and from Odisha. The site is about 800 km south-west of the known southernmost distribution range (Chin Hills, Mizoram) in India and about 600 km south of the Himalaya (Nepal) in the north (BirdLife International 2016).

## REFERENCES

- ALI, S. & S.D. RIPLEY (1998): Handbook of the Birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. Robins to Wagtails. Vol. 9. Oxford University Press, Delhi. Pp. 58–60.
- BIRDLIFE INTERNATIONAL (2016): Species factsheet: *Chaimarrornis leucocephalus*. Downloaded from <http://www.birdlife.org> on February 04, 2016.
- DEL HOYO, J., A. ELLIOTT & D.A. CHRISTIE (Eds) (2005): Handbook of the Birds of the World. Vol. 10. Cuckoo-shrike to Thrushes. Lynx Edicions, Barcelona. Pp. 769.
- MANAKADAN, R., J.C. DANIEL & NIKHIL BHOPALE (2011): Birds of the Indian Subcontinent – a Field Guide. Bombay Natural History Society, Mumbai and Oxford University Press, New Delhi. 262 pp.
- RASMUSSEN, P.C. & J.C. ANDERTON (2012): Birds of South Asia. The Ripley Guide. Vols 1 and 2. 2nd edn. National Museum of Natural History – Smithsonian Institution, Washington DC, Michigan State University, Michigan, and Lynx Edicions, Barcelona.

## 6. RANGE EXTENSION OF GOLDEN-CRESTED MYNA *AMPELICEPS CORONATUS* AND ITS FIRST RECORD IN TRIPURA, INDIA

HARSHAKUMAR CHIKKANARAGUND<sup>1,\*</sup> AND A.K. GUPTA<sup>2</sup>

<sup>1</sup>O/o The SDFO, Kanchanpur Forest Subdivision, North Tripura 799 270, Tripura, India. Email: [harshavcifs@gmail.com](mailto:harshavcifs@gmail.com)

<sup>2</sup>PCCF & CWLW, O/o The PCCF, Tripura, Aranya Bhavan, Nehru Complex, Agartala 799 006, Tripura, India.

Email: [akphayri@gmail.com](mailto:akphayri@gmail.com)

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2i3/114427

The Golden-crested Myna *Ampeliceps coronatus* is poorly known in India. Rare and uncommon in India, it is distributed in Manipur and Assam (Grimmett *et al.* 2010). Elsewhere it occurs from Central and South Myanmar east to South China (SW Yunnan), Laos and Vietnam, south to southern Thailand and Cambodia (Craig and Feare 2009) and is listed as Least Concern by IUCN (2016). The bird is described as “uncommon” and “little known or documented” (Srinivasan 2015). It was not listed by Choudhury (2010) in his checklist of birds of Tripura. Information about the Golden-crested Myna was not found in the Working Plan of Kanchanpur Forest Division.

Tripura is a landlocked state of India, bordering Mizoram to the east and Bangladesh at its north and south. About 15–20 birds were sighted during August to mid September 2015 in open forests on the outskirts of Kanchanpur, North Tripura district, Tripura (24° 01' 59.6" N; 92° 12' 02.3" E; 52 m above msl), and thereafter two individuals were sighted on September 26, 2015 in the same area. Surveys were also done in the adjoining and other areas of the sub-division during August and September, but no adult and/or juvenile

was sighted. The birds were seen in flocks of 15 to 20 along with Common Hill Myna *Gracula religiosa*, feeding on the fruits of tall Champa *Michelia champaca* trees.

They were identified as Golden-crested Myna *Ampeliceps coronatus* on the basis of the following characters: a small, stout-billed myna. Male largely glossy black, with bushy, golden-yellow forehead and crown, yellow throat, naked orange-yellow orbital patch, and yellow patch at the base of primaries. Female with less extensive yellow crown and smaller yellow throat patch. Juvenile dark brown, slightly paler below, with pale yellow throat and pale yellow patch on wing. Voice a higher pitched, more metallic whistle than of Common Hill Myna, and bell-like note.

## ACKNOWLEDGEMENTS

I thank Sneha Harshakumar for her support and encouragement, Sanjib Das IFS, Tsewang G. IFS, and A. Choudhury IAS for their valuable inputs, contributions, and suggestions.

## REFERENCES

- CHOUDHURY, A. (2010): Recent Ornithological records from Tripura, north-eastern India, with an annotated checklist. *Indian BIRDS* 6(3): 66–74.
- CRAIG, A. & C. FEARE (2009): Golden-crested Myna (*Ampeliceps coronatus*). In: del Hoyo, J., A. Elliott, J. Sargatal, D.A. Christie & E. de Juana (Eds) (2014): Handbook of the Birds of the World. Online. Lynx Edicions, Barcelona. <<http://www.hbw.com/>>.
- GRIMMETT, R., C. INSKIPP & T. INSKIPP (2010): Helm Field Guides: Birds of the Indian Subcontinent. 2nd edn. Oxford University Press, New Delhi. Pp. 400.
- IUCN (2016): IUCN Redlist of Threatened Birds. Downloaded on January 20, 2016. <<http://www.iucnredlist.org/>>.
- SRINIVASAN, U. (2015): Rare bird – Gold-crested Myna. Retrieved from Conservation India website. <<http://www.conservationindia.org/gallery/rare-bird-gold-crested-myna>>. Downloaded on January 20, 2016.

7. FIRST RECORD OF BLACK-LEGGED KITTIWAKE *RISSA TRIDACTYLA* IN ODISHA, INDIAMONALISA BHUJABAL<sup>1,2,\*</sup>, NANDA KISHORE BHUJABAL<sup>1,2</sup> AND CHINMAYA BHUJABAL<sup>1,3</sup><sup>1</sup>Wild Orissa, BJ-29, BJB Nagar, Bhubaneswar 751 014, Odisha, India.<sup>2</sup>Email: wildorissa@hotmail.com<sup>3</sup>Email: cbhujabal@rediffmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114428

The Black-legged Kittiwake *Rissa tridactyla* is a small, graceful, cliff-nesting gull, named for its loud, nasal 'kitti-wake' call. As its common name suggests, its short legs are black, which distinguish it from the Red-legged Kittiwake *Rissa brevirostris*. *R. tridactyla* nests on coastlines and islands across much of the North Pacific and North Atlantic oceans (Varty and Tanner 2009), as well as on islands off the northern coasts of Russia and Norway, from northern Canada and northern United States, through Greenland, western and northern Europe, and east as far as the northern Taymyr Peninsula and Severnaya Zemlya in Russia. Outside of the breeding season, the Black-legged Kittiwake moves from the coast to the open ocean. It winters across most of the northern Atlantic and Pacific oceans, as far south as Mexico, West Africa, and the East China Sea. Unlike most other gulls, the Black-legged Kittiwake spends most of the year far out at sea, usually out of sight of land. The hind toe of each foot is reduced to a mere bump, so there are only three functional toes instead of four, giving the Black-legged Kittiwake its specific name *tridactyla* (Harrison 1988).

**Sighting of Black-legged Kittiwake**

Wild Orissa has been engaged in monitoring the presence of various bird species in Odisha since 1999 as part of the Indian Bird Conservation Network (IBCN) initiative (Wild Orissa 2015), of which it is an organizational partner. During a coastal bird survey in Balasore (Odisha), on January 21, 2015, a team from Wild Orissa comprising Nanda Kishore Bhujabal and Chinmaya Bhujabal came across a lone bird, similar in physical appearance to a gull, in a water tank near Chandipur. The bird was sitting on a mud heap in the water and afforded an approach up to 7.6 m. The team observed the bird closely and took photographs. It had a white head and body, grey back, grey wings tipped solid black, with black legs and a dull greenish yellow bill. It had darker grey marks around the crown and the back of the neck, and a dark mark behind the eye. A black collar around the back of the neck, dark patches on the neck and behind the eyes, and black tip to the tail, were the other features noted. The distinct black legs and dull greenish yellow bill drew attention. During the course of observation, the bird took off from its perch, flew around for some time and once again came back to its original

perch. In flight, its distinctive black line pattern across the wings, forming a partial 'M' shape was seen. The bird was inactive while on its perch.

From the features described above, it did not match any of the gull species found in Odisha (Ali and Ripley 1987; Grimmett *et al.* 2011; Rasmussen and Anderton 2012; Ripley 1982). The physical appearance and some behavioural attributes observed, on comparison with the available literature, confirmed its identity to be Black-legged Kittiwake *Rissa tridactyla* (Audubon Society 2015; del Hoyo *et al.* 1996).

**Discussion**

Black-legged Kittiwake has been sighted only on six occasions in the country (Praveen *et al.* 2014). The first record of Black-legged Kittiwake *Rissa tridactyla* in India was during 2001 in Sangam, Sawai Madhopur, Rajasthan (Ullman 2014). The first photo-documented sighting was at Morjim, Goa, on January 16, 2005. The second sighting was at Kadalundi, Kerala on February 8, 2008. The later records of *Rissa tridactyla* were at Alibaug, Maharashtra (November 25, 2012) (Rahane and Bramhankar 2013); Majuli Island, Assam (November 30, 2012); and Chavakkad, Kerala (January 24, 2013). The confirmation of the spotting of a pair of Black-legged Kittiwake in the Kadalundi-Vallikkunnu Community Reserve (Das *et al.* 2013) has drawn the attention of ornithologists to Kadalundi, a significant stopover in the Indian subcontinent for migrant birds of Europe and the Atlantic region.

The last report was by a researcher from the Wildlife Division of the Kerala Forest Research Institute, Peechi, who reported sighting a pair of Black-legged Kittiwake at Chavakkad in Kerala on January 24, 2013 (Naha 2013).

According to Balachandran *et al.* (2009) and Envis Centre on Avian Ecology (2015), Odisha had never reported the presence of Black-legged Kittiwake *Rissa tridactyla*, so this report adds one more species to the birdlist for this state. This finding assumes much significance for bird migration and bird ecology, as a species which inhabits the northern top portion of the hemisphere chose to come down to coastal Odisha, separated by many thousands of kilometres from its known breeding and wintering areas.

*Rissa tridactyla* nests on coastlines and islands across much of the North Pacific and North Atlantic Oceans, as well as on islands off the northern coasts of Russia and Norway. The nominate race *R. t. tridactyla* breeds in the North Atlantic, from northern Canada and northern United States, through Greenland, western and northern Europe, and east as far as the northern Taymyr Peninsula and Severnaya Zemlya in Russia. *R. t. pollicaris* breeds in the North Pacific, from north-eastern Siberia, Kamchatka, the Sea of Okhotsk and Kuril Island, through the Bering Sea and east to Alaska. Outside of the breeding season, the Black-legged Kittiwake moves from the coast to the open ocean. It winters across most of the northern Atlantic and Pacific Oceans, as far south as Mexico, West Africa, and the East China Sea.

### Conclusion

Since Black-legged Kittiwake *Rissa tridactyla* nests on coastlines and islands across much of the North Pacific and North Atlantic oceans, as well as on islands off the northern coasts of Russia and Norway, Europe, and east as far as the northern Taymyr Peninsula and Severnaya Zemlya in Russia, its presence in the state of Odisha could be significant, considering the changes in climatic patterns being observed as well as possible impacts from developmental activities being undertaken in habitats. Further, since it is known to winter across most of the northern Atlantic and Pacific Oceans, as far south as Mexico, West Africa, and the East China Sea, a sight record during January in Odisha calls for further investigation.

### REFERENCES

- ALI, S. & S.D. RIPLEY (1987): Compact Handbook of the Birds of India and Pakistan, together with those of Bangladesh, Nepal, Sikkim, Bhutan and Sri Lanka. 2nd edn. Oxford University Press, Delhi.
- AUDUBON SOCIETY (2015): Guide to North American Birds. Retrieved from <http://birds.audubon.org/birds/black-legged-kittiwake>. January 2015.
- BALACHANDRAN, S., P. SATHIYASELVAM & S. PANDA (2009): Bird Atlas of Chilika. Bombay Natural History Society and Chilika Development Authority. Bombay Natural History Society, Mumbai.
- DAS, S., S. KECHERY, P.P. SREENIVASAN & C. SREERANJ (2013): Black-legged Kittiwake (*Rissa tridactyla*) from Puthankadapuram, Kerala. *Indian BIRDS* 8(3): 73.
- DEL HOYO, J., A. ELLIOTT & J. SARGATAL (1996): Handbook of the Birds of the World. Vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
- ENVIS CENTRE ON AVIAN ECOLOGY (2015): Bird Checklist of Odisha. [www.bnhsenvis.nic.in](http://www.bnhsenvis.nic.in). Retrieved on January 21, 2015.
- GRIMMETT, R., C. INSKIPP & T. INSKIPP (2011): Birds of the Indian Subcontinent. Christopher Helm, London.
- HARRISON, PETER (1988): Seabirds: An Identification Guide. Christopher Helm, London.
- NAHA, A.L. (2013): Confusion over sighting of rare bird species. The Hindu. February 25 2013, Malappuram.
- PRAVEEN, J., R. JAYAPAL & A. PITTIE (2014): Notes on Indian Rarities - 2: Waterfowl, Diving Waterbirds, and Gulls and Terns. *Indian BIRDS* 9(5 & 6): 113–136.
- RAHANE, C. & S. BRAMHANKAR (2013): First record of Black-legged Kittiwake *Rissa tridactyla* from Maharashtra, India. *Indian BIRDS* 8(3): 69.
- RASMUSSEN, P.C. & J.C. ANDERTON (2012): Birds of South Asia. The Ripley Guide. Vols 1 and 2. 2nd edn. National Museum of Natural History – Smithsonian Institution, Washington DC, Michigan State University, Michigan, and Lynx Edicions, Barcelona, Spain.
- RIPLEY, S.D. (1982): A Synopsis of the Birds of India and Pakistan. 2nd edn. Bombay Natural History Society, Bombay.
- ULLMAN, M. (2014): Kittiwake *Rissa tridactyla* recorded in Rajasthan, India in 2001. *Indian BIRDS* 9(3): 67–68.
- VARTY, N. & K. TANNER (2009): Background document for Black-legged kittiwakes *Rissa tridactyla tridactyla*. *Biodiversity Series*. OSPAR Commission, London.
- WILD ORISSA (2015): Indian Bird Conservation Network Program. Programs. [www.wildorissa.org](http://www.wildorissa.org). Retrieved on January 28, 2015.

## 8. THE MONSOON FEAST: CONGREGATION OF BIRDS FEEDING ON A TERMITE SWARM AT WALAYAR, KERALA, INDIA

SELVARAJ RAMESH KUMAR<sup>1</sup>

<sup>1</sup>Division of EIA, Sálim Ali Centre for Ornithology and Natural History, P.O. Anaikatti, Coimbatore 641 108, Tamil Nadu, India.  
Email: [ramesh.wild@gmail.com](mailto:ramesh.wild@gmail.com)  
doi: 10.17087/jbnhs/2015/v112i3/114429

Winged termites (alates or swarmers) are reproductive termites which emerge from a nest to create new colonies. These termites are poor fliers; they fly a few metres then shed their wings and look for new nesting sites. The alate swarms are an unanticipated food source for many animals. The congregation of birds on these swarms is an interesting phenomenon as shortage of food often makes some birds explore new territories for foraging (Sazima 1989; Vasava

2011). Studies on bird assemblages on termite swarms are reported from North America (Blake 1941; Cowan 1942; Lamore 1959; Manolis 2010), Brazil (Olson and Alvarenga 2006; Sazima 2008; Vasconcelos *et al.* 2015), and Africa (Bussi re and Wijers 2013; Dial and Vaughan 1987). Although a widespread and common phenomenon, there is little published information from India (Ali and Ripley 2001; Vasava 2011).

**Table 1:** Birds seen feeding on flying termites (Nomenclature as in Grimm et al. (2011))

Sl. No.	Family	Common Name	Scientific Name	No. of Individuals	Feeding Height (m)	Location Type
1	Corvidae	Indian Jungle Crow	<i>Corvus (macrorhynchos) culminatus</i>	5	0 to 1	Open space
2	Corvidae	House Crow	<i>Corvus splendens</i>	3	0 to 1	Open space
3	Timaliidae	Yellow-billed Babbler	<i>Turdoides affinis</i>	10	0 to 2	Open space
4	Chloropseidae	Golden-fronted Leafbird	<i>Chloropsis aurifrons</i>	6	1 to 3	Open space
5	Pycnonotidae	Red-vented Bulbul	<i>Pycnonotus cafer</i>	8	3 to 5	Open space
6	Cisticolidae	Common Tailorbird	<i>Orthotomus sutorius</i>	8	1 to 2	Open space
7	Ramphastidae	Brown-headed Barbet	<i>Megalaima zeylanica</i>	1	4 to 5	Open and dense vegetation
8	Alcedinidae	White-throated Kingfisher	<i>Halcyon smyrnensis</i>	1	1 to 3	Open space
9	Corvidae	Rufous Treepie	<i>Dendrocitta vagabunda</i>	5	0 to 4	Dense vegetation
10	Cuculidae	Southern Coucal	<i>Centropus (sinensis) parroti</i>	1	0 to 1	Dense vegetation
11	Nectariniidae	Purple-rumped Sunbird	<i>Leptocoma zeylonica</i>	6	2 to 4	Dense vegetation
12	Phasianidae	Indian Peafowl	<i>Pavo cristatus</i>	3	0 to 1	Dense vegetation
13	Pycnonotidae	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i>	4	3 to 4	Dense vegetation
14	Pycnonotidae	White-browed Bulbul	<i>Pycnonotus luteolus</i>	2	3 to 4	Dense vegetation
15	Sturnidae	Common Myna	<i>Acridotheres tristis</i>	6	0 to 5	Open space
16	Apodidae	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	25	4 to 10	Sky

Here I report a gathering of at least 16 bird species feeding on alates emerging from two earthen holes in my backyard in a small village named Poolamparai. The village is close to the foothills of Western Ghats near Walayar in the state of Kerala (10° 48' 57.44" N; 76° 49' 26.73" E; 168 m above msl). The site is located in the Palghat Gap (a 40 km break in the otherwise continuous chain of mountains of the Western Ghats) and receives heavy rainfall during the south-west monsoon period from June to September, with an annual rainfall of about 2,000 mm. This region has a tropical wet and dry climate, with temperatures ranging from 21 to 37 °C. It is generally rocky and surrounded by human habitations, agricultural fields, and a river which flows 200 m from the observation site. The entire area of observation was about 0.3 sq. km (0.121 hectares). Major plants in the site include *Azadirachta indica*, *Tectona grandis*, *Wrightia tinctoria*, *Mangifera indica*, *Santalum album*, *Manihot glaziovii*, *Leucaena leucocephala*, *Psidium guajava*, *Vitex negundo*, and *Sida acuta*.

On July 28, 2015, the morning was pleasant and partially cloudy; the last rain in the area had fallen in the previous week. At about 09:00 hours, my six-month old puppy was the first to notice the emerging alate termites and started feeding on them. Soon a pair of Indian Jungle Crows *Corvus (macrorhynchos) culminatus* and a House Crow *Corvus splendens*, which were feeding on scraps of food from our home, came near the hole in the earth where the alate termites (hereafter termites) emerged and started feeding on them. Till

this time I had not found it unusual, as I have noticed reptiles and birds feeding on flying termites on many occasions (a couple of times in the same place), but when I noticed a pair of Golden-fronted Leafbird *Chloropsis aurifrons* flying in the open sky and catching termites, I began observing the phenomenon. At that time, I neither had a camera to shoot the scene nor did I have binoculars for a close look. So I settled about four metres away from the hole, with a notebook and pen, and for the next one and a half hours, jotted down my observations. All the bird species I observed foraging on winged termites are given in Table 1 in the order of arrival at the site.

Apart from the 16 species which were noticed feeding on termites, a female Asian Koel *Eudynamis scolopaceus* sitting on a Teak tree was also seen around the thickly vegetated area, but I did not see it catching termites, may be due to thick vegetation. Likewise, a pair of Pale-billed Flowerpecker *Dicaeum erythrorhynchos* and a Purple-rumped Sunbird *Leptocoma zeylonica* were spotted for a few seconds, but not seen catching termites. But I strongly suspect these two species were also feeding on termites as they were actively flying and hovering (sunbird) in the middle of the vegetation.

Other than birds, four Indian Palm Squirrels *Funambulus palmarum* were also feeding on the termites on the ground. Among reptiles, at least six *Calotes versicolor* were feeding on the ground and often running up trees and a fence to catch the termites. 12 species of Odonates, namely *Lathrecista asiatica*, *Tramea limbata*, *Orthetrum sabina*, *Bradinopyga*

*geminata*, *Potamarcha congener*, *Diplacodes trivialis*, *Pantala flavescens*, *Trithemis pallidinervis*, *Orthetrum chrysis*, *Rhyothemis variegata*, *Aethriamanta brevipennis*, and *Ceriagrion coromandelianum* (nomenclature from Subramaniam 2009) were seen around the site, but only *Pantala flavescens* were seen catching the termites in the air. About 15 individuals of *Pantala flavescens* were catching the termites in flight and sometimes they missed and dropped the termites after catching them. No birds attempted to catch the dragonflies during my observation.

Bird species such as Golden-fronted Leafbird, Asian Palm Swift, and Common Tailorbird were completely focused on feeding on the termites near me. Such focused behaviour may put the predator in danger (at least in human-dominated area), for instance, on the morning of August 22, 2014, along with my colleagues Mohamed Samsoor Ali and G. Srinivas, I counted 23 road kills of reptiles *Calotes versicolor* (14 nos), *Mabuya* sp. (8 nos) and *Calotes calotes* (1 no.) after a termite swarm. The carcasses were found within a 4 km stretch of mountain road near Mangarai (11° 04' 43.27" N; 76° 49' 22.53" E) which is 30 km away from the present observation.

My observations are similar in many respects to those of Olson and Alvarenga (2006) and Sazima (2008) in Brazil. There was no interspecific competition for foraging, as different species maintained different strata, and there was an enormous abundance of termites. The feeding guild of birds observed includes omnivores, frugivores, granivores, and insectivores, similar to the observations of Olson and Alvarenga (2006). No raptors were recorded as in the case of Olson and Alvarenga (2006) and Sazima (2008). Similar to observations from Brazil (Vasconcelos *et al.* 2015), the present observation was made at the commencement of the rainy season and the breeding season of most of the birds. This makes alate termites an unexpected supplement of protein and energy for breeding birds, therefore it is important to document this sporadic and short-lived phenomenon.

#### ACKNOWLEDGEMENTS

I am grateful to Mr. P. Manikandan, Mr. Prakash, Ms. Suhirtha Muhil, and Dr. S. Babu of SACON, for their contribution in various ways. I also thank Director, SACON and Dr. P.R. Arun of SACON for their support and encouragement.

#### REFERENCES

- ALI, S. & S.D. RIPLEY (2001): Handbook of the Birds of India and Pakistan. Oxford University Press, Delhi. Vol. 4. 164 pp.
- BLAKE, C.H. (1941): Termites taken by birds. *Auk* 58: 104.
- BUSSIÈRE, E. & M. WIJERS (2013): Foraging frenzy: more than 50 raptors at a termite swarm. *Ornithological Observations* 4: 11–18.
- COWAN, I.M. (1942): Termite-eating by birds in British Columbia. *Auk* 59: 451.
- DIAL, K.P. & T. VAUGHAN (1987): Opportunistic predation on alate termites in Kenya. *Biotropica* 19: 185–187.
- GRIMMETT, R., C. INSKIPP & T. INSKIPP (2011): Birds of the Indian Subcontinent. 2nd edn. Oxford University Press. 528 pp.
- LAMORE, D.H. (1959): Blue Jay feeding on termites. *Wilson Bulletin* 71: 193.
- MANOLIS, T. (2010): Yellow-rumped Warbler and other bird species foraging on winged termites in Sacramento, California. *CVBC Bulletin* 13: 62–64.
- OLSON, S.L. & H.M.F. ALVARENGA (2006): An extraordinary feeding assemblage of birds at a termite swarm in the Serra de Mantiqueira, Sao Paulo, Brazil. *Revista Brasileira de Ornitologia* 14: 297–299.
- SAZIMA, I. (1989): Peach-fronted parakeet feeding on winged termites. *Wilson Bulletin* 101: 656–657.
- SAZIMA, I. (2008): Dancing in the rain: swarms of winged termites congregate at a varied bird assemblage at an urban backyard in southeastern Brazil. *Revista Brasileira de Ornitologia* 16: 402–405.
- SUBRAMANIAM, K.A. (2009): Dragonflies of India – A field guide, Vigyan Prasara, Department of Science and Technology, Govt of India. 168 pp.
- VASAVA, A. (2011): Crested Serpent-Eagle *Spilornis cheela* preying on termites (Termitidae) in Shoolpaneshwar Wildlife Sanctuary, Gujarat, India. *Indian BIRDS* 7(2): 56.
- VASCONCELOS, M.F., D. HOFFMANN, M.C. ARAU' J. & P.N. VASCONCELOS (2015): Bird-termite interactions in Brazil: A review with perspectives for future studies. *Biota Neotropica* 15: 1–22.

### 9. BLUE ROCK PIGEON *COLUMBA LIVIA* (FAMILY COLUMBIDAE) PREYING ON WINGED TERMITES (INSECTA: ISOPTERA)

ASHISH SHUKLA<sup>1</sup>

<sup>1</sup>Behind Town School, Mangal Bazar, PO/Dist. Jharsuguda 768 201, Odisha, India. Email: ashish\_641@yahoo.in  
doi: 10.17087/jbnhs/2015/v11i2i3/114430

Swarms of winged termites provide a rich source of food to myriad species of animals, birds, and reptiles. Owing to their flying abilities, some birds can hawk this prey in the air,

whereas others have to wait till the termites fall to the ground. Birds of different species assemble to make the most of the situation and catch as many of these protein-rich insects as

possible. Such swarm sites provide a magnificent opportunity to watch birds of different kinds on one stage.

On June 25, 2016, at about 6:45 hours while watching one such feeding frenzy over some fallow land in front of my residence in Jharsuguda (Odisha), I noticed a party of nine Blue Rock Pigeon *Columba livia* moving rapidly from place to place and pecking at the ground intermittently. Their behaviour prompted me to take a closer look at their unusual activity. I noted that the pigeons were feeding on the winged termites, albeit in an awkward manner. While they were unable to hawk the termites in the air, they grabbed them as soon as they fell to the ground.

The Blue Rock Pigeon is known to be a granivorous bird which feeds on various cereals, pulses, groundnut, weeds, small tubers, and green shoots of crops, and usually consumes a quantity of grit [Ali, S. and S.D. Ripley (1987): Compact Handbook of the Birds of India and Pakistan together with those of Bangladesh, Nepal, Bhutan and Sri Lanka. 2nd edn. Oxford University Press, Delhi]. To the best of my knowledge, feeding on insects is unheard of within the pigeons and doves family (Columbidae) and this incident may be the first report of its kind when winged termites were included in the diet of the bird.

# 10. REPORT OF ROCK AGAMA *PSAMMOPHILUS* SP. PREYING ON FAN-THROATED LIZARD *SITANA* SP. IN GOMARDAH WILDLIFE SANCTUARY, RAIGARH DISTRICT, CHHATTISGARH, INDIA

A.M.K.BHAROS<sup>1,4,\*</sup>, AKHILESH BHAROS<sup>1,5</sup>, N.D. AGRAWAL<sup>2</sup> AND SHISHIR DAS<sup>3</sup>

<sup>1</sup>B-101, Gayatri nagar, P.O. Shankar nagar, Raipur 492 007, Chhattisgarh, India.

<sup>2</sup>I-C, Anupum nagar, Raipur 492 007, Chhattisgarh, India. Email: agrawal\_nd@hotmail.com

<sup>3</sup>Vicharpur Kothi, Station Road, Raipur 492 001, Chhattisgarh, India. Email: shishir.abhi@gmail.com

<sup>4</sup>Email: cwsraipur@yahoo.co.in

<sup>5</sup>Email: wildcentralindia@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2i3/114431

During our visit to the Gomardah Wildlife Sanctuary, district Raigarh, Chhattisgarh (21.58° N; 83.08° E), on June 06, 2015, at Compartment 912, we observed an adult male Rock Agama *Psammophilus* sp. holding an adult female Fan-throated Lizard, *Sitana* sp. in its jaw on a large boulder on the side of a road at 10:40 hrs. As this was unusual behaviour, we took a few photographs, with minimal disturbance to the animals. The *Psammophilus* sp. was holding *Sitana* sp. by its neck; the latter was motionless and we assumed it was not alive. We observed this event for about 15 minutes as the *Psammophilus* moved from one boulder to another, eventually disappearing into a large crevice, still holding the prey.

The agamid genus *Psammophilus*, commonly called Rock Agama, is endemic to India and is represented by two species *Psammophilus dorsalis* and *P. blanfordanus* (Smith 1935; Uetz and Hošek 2015). The old and new records of *P. dorsalis* are from Andhra Pradesh, Karnataka, Kerala, Tamil Nadu, South Arcot, Nallamalai Hills, Malabar, Mysore, Nilgiris, Bihar, Odisha, and Madhya Pradesh (Uetz and Hošek 2015). The other species *P. blanfordanus* is known from Gujarat, Bihar, Odisha, Central Provinces, Madhya Pradesh, Eastern Ghats, Andhra Pradesh, and Kerala, Travancore south to Trivandrum, and Tamil Nadu (Uetz and Hošek 2015).

*Sitana*, a widely distributed agamid genus, commonly called Fan-throated Lizard, is presently represented by two species, *Sitana deccanensis* and *S. ponticeriana* in India (Amarsinghe *et al.* 2015; Smith 1935). Recently, the taxonomy of this genus was revised, with descriptions of additional new species (Varad Giri pers. comm.).

The reptile diversity of Chhattisgarh is poorly documented except for a few anecdotal studies in Bastar district (Chandra and Gajbe 2005; Sanyal and Dasgupta 1990). Both these studies reported occurrence of *Psammophilus blanfordanus*, *P. dorsalis*, and *Sitana ponticeriana* from Chhattisgarh. Due to lack of close observations of taxonomic characters, we only mention the genus of the lizards in this study.

*Psammophilus* is a rock-dwelling agamid frequenting rocky outcrops (Balkrishna 2014), also seen on ground, small bushes, and at the base of trees in some places in Central India (Varad Giri pers. comm.). Studies on the diet of *P. dorsalis* in urban-rural landscapes suggests that it is mainly myrmecophagous, with the female's diet constituted of Lepidoptera larvae (25%) and Coleoptera (62.5%) (Balakrishna 2014). The only known study on the dietary composition of *P. blanfordanus* reports that it mostly feeds on ants (28.51%) and termites (12.47%) (Aruna *et al.* 1993). The vertebrates reported in the diet of *Psammophilus* are

skink *Mabuya* sp. (Aruna *et al.* 1993), Black Rat *Rattus rattus* (Balkrishna 2014), and Truetler's Gecko *Hemidactylus treutleri* (Sreekar *et al.* 2010). This is the third confirmed report (Aruna *et al.* 1993; Sreekar *et al.* 2010) of predation by *Psammophilus* on another lizard, *Sitana* sp. The Fan-throated Lizard *Sitana* sp. is predominantly a ground-dwelling agamid (Smith 1935) though the males climb small bushes or rocks for display during breeding season.

The agamid genera *Psammophilus* and *Sitana* are sympatric in their distribution in many places, but they prefer different habitats and thus rarely occur together. Thus this observation of *Psammophilus* feeding on *Sitana*

is noteworthy. Although most of the references mentioned above were incidental reports, it appears that *Psammophilus* is generalist in its feeding behaviour and further detailed studies are needed to fully understand the dietary composition of these lizards in their range.

### ACKNOWLEDGEMENTS

Thanks to Varad Giri of National Centre for Biological Sciences, Bengaluru, for identification of the lizards, comments, and encouragement to prepare this note. Thanks to the State forest department for permission to do this study.

### REFERENCES

- AMARSINGHE, A.A.T., I. INEICH, D.M.S. KARUNARATHNA, W.M.S. BOTEJUE & P.D. CAMPBELL (2015): Two new species of agamid lizard of the genus *Sitana* Cuvier from Sri Lanka, with a taxonomic revision of Indian species. *Zootaxa* 3915: 67–98.
- ARUNA, C.H., T.B. REDDY & M.V.S. RAO (1993): Feeding ecology of *Psammophilus blanfordanus* (Stoliczka). *J. Bombay Nat. Hist. Soc.* 90(2): 295–296.
- BALAKRISHNA, S. (2014): Predation of Black rat *Rattus rattus* (Rodentia: Muridae) by the Rock lizard *Psammophilus dorsalis* (Squamata: Agamidae) from sub-urban Bangalore, Karnataka. *Herpetology Notes* 7: 519–520.
- CHANDRA, K. & P.U. GAJBE (2005): An inventory of herpetofauna of Madhya Pradesh and Chhattisgarh. *Zoos' Print Journal* 20: 1812–1819.
- SANYAL, D.P. & G. DASGUPTA (1990): On a collection of reptiles from Bastar district, Madhya Pradesh, Central India. *Hamdryad* 15: 18–20.
- SMITH, M.A. (1935): The Fauna of British India, including Ceylon and Burma. Reptilia and Amphibia. Vol. II—Sauria. Taylor and Francis, London. xiii + 440 pp., 2 maps, 1 pl.
- SREEKAR, R., S. DEODHAR & Y. KULKARNI (2010): Predation on *Hemidactylus treutleri* (Squamata: Gekkonidae) by the Peninsular Rock Agama *Psammophilus dorsalis* (Squamata: Agamidae) in Rishi Valley, Andhra Pradesh, India. *Herpetology Notes* 3: 033–035.
- UETZ, P. & J. HOŠEK (2015): The Reptile Database. <http://www.reptile-database.org>. Accessed on December 14, 2015.

## 11. RABBIT FISH *SIGANUS CANALICULATUS*: A NEW HOST RECORD FOR ISOPOD PARASITE *NEROCILA ARRES* BOWMAN AND TAREEN, 1983

MALAY KANTI DEV ROY<sup>1</sup>, SHIBANANDA RATH<sup>2,\*</sup>, SANTANU MITRA<sup>3</sup> AND SUBHRENDU SEKHAR MISHRA<sup>4</sup>

<sup>1</sup>Social Environmental and Biological Association, 33C, Madhab Halder Road, Behala, Kolkata 700 034, West Bengal, India. Email: malay\_7@rediffmail.com

<sup>2</sup>Cytotaxonomy Research Laboratory, Molecular Systematics Division, Zoological Survey of India, 'M' Block, New Alipore, Kolkata 700 053, West Bengal, India. Email: shiba12345@rediffmail.com

<sup>3</sup>Crustacea Section, Zoological Survey of India, 27, Jawaharlal Nehru Road, Kolkata 700 016, West Bengal, India. Email: santanuzsi@gmail.com

<sup>4</sup>Marine Fish Section, Zoological Survey of India, 27, Jawaharlal Nehru Road, Kolkata 700 016, West Bengal, India. Email: subhrendumishra@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114432

During a faunistic survey along the Odisha coast, some cymothoid isopod parasites were collected from fishes, of which a single specimen (ZSI Reg. No. C 6758/2) obtained from Rabbit Fish *Siganus canaliculatus* was identified as *Nerocila arres* Bowman and Tareen, 1983 (Fig. 1). The specimen measured 20.5 mm in length and 12.0 mm in width. The species is characterized by the following features: Rounded anterior margin of the cephalon and well-separated proximal segment of antennae; Pereopods 6 and 7 with marginal spines; Postero-ventral corner of all pereonites

produced, 1–5 subequal and 6–7 progressively longer; Telson with distinct caudomedial lobe; Exopod of uropod sublinear, a little longer than endopod; Endopod with deep notch on lateral margin and serrate median margin, serrations deep; Uropodal endopod less than three times as long as broad (Bowman and Tareen 1983). Pereopod 6 beset with one spine on merus, 4 on carpus, and 5 on propodus; Pereopod 3 lacking spine on propodus.

*Nerocila arres* closely resembles *Nerocila trivittata* and *Nerocila sigani*. However, in *N. trivittata* the uropodal

**Table 1:** Recorded fish hosts of *Nerocila arres* Bowman and Tareen, 1983

Host fish species	Family	Site of infection	References
<i>Epinephalus tauvina</i> (Forskål, 1775)	Serranidae	Caudal fin	Bowman and Tareen, 1983
<i>Acanthopagurus latus</i> (Houttuyn, 1782)	Sparidae	—	Bowman and Tareen, 1983*
<i>Siganus canaliculatus</i> (Park, 1797)	Siganidae	Caudal fin	Present paper
<i>Nemipterus japonicus</i> (Bloch, 1791)	Nemipteridae	Caudal fin	Bowman and Tareen, 1983; Trilles <i>et al.</i> 2013
<i>Nemipterus peronii</i> (Valenciennes, 1830) = <i>Nemipterus tolu</i> (Valenciennes, 1830)	Nemipteridae	Caudal fin	Bowman and Tareen, 1983

\*Bowman and Tareen (1983) does not mention the site of infection for the species *Acanthopagurus latus* (Houttuyn, 1782)

endopod is distinctly 3.5 times longer than broad and serrations on its lateral margins are shallow, whereas in *N. arres* the uropodal endopod is less than three times as long as broad and serrations on its lateral margins are deep (Bowman and Tareen 1983). In *N. sigani*, telson is evenly rounded posteriorly without a caudomedial lobe which is very prominent in *N. arres*. In *N. sigani* pereopod 6 has 2 spines on merus, 3 on carpus, and 5 on propodus whereas it bears 1 spine on merus, 4 on carpus, and 5 on propodus in *N. arres*. Pereopod 3 has 2 spines in *N. sigani* but no spines in *N. arres*.

A perusal of literature reveals that the occurrence of this isopod parasite on *Siganus canaliculatus* is a new host record for this parasite (Bowman and Tareen 1983; Trilles *et al.* 2013). Bowman and Tareen (1983) described *Nerocila arres* from four different species of fishes of Arabian Gulf in Kuwait (Table 1).

Trilles *et al.* (2013) recorded this species from Nagapattinam on the Bay of Bengal coast in Tamil Nadu, from the fish *Nemipterus japonicus* (Bloch, 1791). The present communication thus constitutes the second record of this parasite from India, and first report from the state of Odisha. Incidentally, Barnard (1936) recorded an isopod parasite belonging to the genus *Nerocila*, namely *N. trivittata* Bleeker, 1857 from the fish *Hexanematichthys sagor* from Devi river in Odisha, while Dev Roy and Mitra (2013)



Fig. 1: a. *Nerocila arres* on its host *Siganus canaliculatus*, b. Enlarged view of *N. arres* attached to caudal fin of *S. canaliculatus*, c. Dorsal view of *N. arres*.

recorded *Nerocila sigani* from *Terapon theraps* at Paradeep, Odisha. As such, the present parasite *N. arres* represents the third species of this genus from the State.

## REFERENCES

- BARNARD, K.H. (1936): Isopoda collected by R.I.M.S. Investigator. *Records of the Indian Museum* 38: 147–191.
- BOWMAN, T.E. & I.U. TAREEN (1983): Cymothoidae from Fishes of Kuwait (Arabian Gulf) (Crustacea: Isopoda). *Smithsonian Contributions to Zoology*, Smithsonian Institution Press, Washington DC. pp. 1–30.
- DEV ROY, M.K. & S. MITRA (2013): New host record for *Nerocila sigani* (Isopoda: Cymothoidae) from Odisha coast, India. *Current Science* 104(9): 1134–1135.
- TRILLES, J.P., G. RAMESHKUMAR & S. RAVICHANDRAN (2013): *Nerocila* species (Crustacea: Isopoda: Cymothoidae) from Indian marine fishes. *Parasitol Res.* 112(3): 1273–1286. doi: 10.1007/s00436-012-3263-5.

## 12. *BUCHANANIA COCHINCHINENSIS* (LOUR.) M.R. ALMEIDA: A NEW HOST PLANT FOR *SCUTELLERA PERPLEXA* (WESTWOOD) (HEMIPTERA: SCUTELLERIDAE)

AKSHAY A. ONKAR<sup>1</sup> AND ASHISH N. NERLEKAR<sup>2,\*</sup>

<sup>1</sup>Department of Botany, Fergusson College, Pune 411 004, Maharashtra, India. Email: onkarakshay@yahoo.in

<sup>2</sup>Department of Biodiversity, Abasaheb Garware College, Pune 411 004, Maharashtra, India. Email: ashishadmirerofficus@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i3/114434

The family Scutelleridae under superfamily Pentatomoidea (Insecta: Heteroptera) consists of bugs (popularly called jewel bugs) that are distinguished by the presence of an enlarged scutellum (Cassis and Vanags 2006). Scutellerid bugs are known to feed on an array of plants including those from primitive families such as Magnoliaceae to the more evolved ones such as Asteraceae and Poaceae (Tsai *et al.* 2011). *Scutellera perplexa* (Westwood) (= *S. nobilis* Distant) is one such pest of considerable economic importance that affects several crops belonging to the families Euphorbiaceae (Schaefer and Panizzi 2000) and Rhamnaceae (Singh *et al.* 2014). From India, *S. perplexa* has been reported as a pest on *Jatropha curcas* L. (Shanker and Dhyani 2006), *J. nana* Dalz & Gibs. (Kulkarni *et al.* 2010), *Murraya koenigii* (L.) (Tara and Sharma 2010), *Embllica officinalis* Gaertn (Meshram and Garg 1999), *Vitis vinifera* L. (Singh and Kaur 2015), and *Ziziphus mauritiana* Lam. (Singh *et al.* 2014). Yet, there has been no report of this species affecting the Anacardiaceae, including *Buchanania cochinchinensis* (Lour.) M.R. Almeida (common name: Chironji), an economically valuable tree species.

We report an opportunistic observation from the Padmabhooshan Vasantdada Patil Institute of Technology (PVPIT) hill (18° 29' 51.74" N; 73° 46' 19.60" E) near Pune city, Maharashtra, where *Scutellera perplexa* was seen feeding on *Buchanania cochinchinensis*. The area is well-connected to the National Defence Academy (NDA) hills and still bears a fair percentage of southern dry mixed deciduous forest (according to the types described by Champion and Seth 1968) with dominant trees such as *Madhuca longifolia* var. *latifolia* (Roxb.) A. Chev., *Diospyros melanoxylon* Roxb., *Tectona grandis* L.f., *Dalbergia latifolia* Roxb., and *Buchanania cochinchinensis* (Lour.) M.R. Almeida.

On April 20, 2015, we observed nymphs of a scutellerid bug on a Chironji tree about 1.5 m above ground (Fig. 1). About 25 nymphs were seen aggregated on the abaxial side of the leaf, one of which was collected, reared till maturity, and later identified as *Scutellera perplexa* based on the description in Distant (1977) and validation by expert, Dr. H.V. Ghate. Two adult *S. perplexa* were found on further visits to the



Fig. 1: *Scutellera perplexa* nymphs seen aggregating on the underside of *Buchanania cochinchinensis* leaf

same tree on May 01, 2015. Freshly hatched instars were also observed aggregating on fruits of another Chironji tree in a nearby area on March 25, 2016.

*Buchanania cochinchinensis* is an economically important tree species, known for its much valued fruit as well as several other ethnomedicinal uses (Malik *et al.* 2012). It yields one of the most important Non-Timber Forest Produce (NTFP) in India and plays a significant role in tribal life, especially in the Central Indian landscape (Chopra 1997). Hence, there is a need to confirm the occurrence of the pest *Scutellera perplexa* on other populations of the Chironji tree in India. Further studies focusing on the damage potential and management of this pest on Chironji are necessary.

**Endnote:** While the manuscript was under review, the first author also observed first instars of *S. perplexa* emerging from eggs laid on *Kydia calycina* Roxb. (Malvaceae) at Melghat Tiger Reserve, Maharashtra on November 06, 2015 (Eds: photographic evidence provided). Similarly, the second author observed first instars emerging from eggs on *Gliricidia sepium* (Jacq.) Kunth (Fabaceae) on April 24, 2016, at the Vetil hill, Pune.

## ACKNOWLEDGEMENTS

We extend our gratitude towards Dr. H.V. Ghate for identification of the specimens and for providing selected

references. We would also like to thank Rohan Phatak, Anand Nawathe, Ninad Diwanji, and Salil Hangekar for support in the field. Thanks are due to Dr. D.K. Kulkarni for providing some references and encouragement.

## REFERENCES

- CASSIS, G. & L. VANAGS (2006): Jewel Bugs of Australia (Insecta, Heteroptera, Scutelleridae). 398 pp.
- CHAMPION, H.G. & S.K. SETH (1968): A Revised Survey of the Forest Types of India. Government of India publication, Delhi. 404 pp.
- CHOPRA, K. (1997): The valuation and pricing of non-timber forest products: conceptual issues and a case study from India. In: Fraser, S. (Ed.): Environmental sustainability: Practical global implications. CRC Press. 304 pp.
- DISTANT, W.L. (1977): The Fauna of British India including Ceylon and Burma – Rhynchota – Vol. 1 (Heteroptera). Indian Reprint. Today and Tomorrow Printers and Publishers, New Delhi.
- KULKARNI, D.K., R. BHAGAT & H.V. GHATE (2010): Occurrence of pentatomid bug on *Jatropha nana* Dalz. *Indian Journal of Tropical Biodiversity* 17(1): 125–126.
- MALIK, S.K., R. CHAUDHURY, N.S. PANWAR, O.P. DHARIWAL, R. CHOUDHARY & S. KUMAR (2012): Genetic resources of Chironji (*Buchanania lanzan* Spreng.): a socio-economically important tree species of central Indian tribal population. *Genetic Resources and Crop Evolution* 59(4): 615–623.
- MESHRAM, P.B. & V.K. GARG (1999): A report on the occurrence of *Scutellera nobilis* Fab. on *Emblica officinalis* Gaertn. *Indian Forester* 125(5): 536.
- SCHAEFER, C.W. & A.R. PANIZZI (Eds) (2000): Heteroptera of Economic Importance. CRC Press. 856 pp.
- SHANKER, C. & S.K. DHYANI (2006): Insect pests of *Jatropha curcas* L. and the potential for their management. *Current Science* 91(2): 162–163.
- SINGH, S. & G. KAUR (2015): Incidence of metallic shield bug, *Scutellera perplexa* (Westwood) (= *S. nobilis* Fabricius) on grape in Punjab. *Pest Management in Horticultural Ecosystems* 21(1): 90–94.
- SINGH, J.P., A.K. JAISWAL & M. MONOBRULLAH (2014): First record of some insect pests on commercial lac host plant, *Ziziphus mauritiana* from India. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences*. Pp. 1–8.
- TSAL, J.F., D. RÉDEI, G.F. YEH & M.M. YANG (2011): Jewel Bugs of Taiwan (Heteroptera: Scutelleridae). National Chung Hsing University, Taichung, 309 pp.
- TARA, J.S. & M. SHARMA (2010): Record of hemipteran insect pest diversity on *Murraya koenigii* (L.) Sprengel (curry leaf), a medicinally important plant from Jammu region of J&K state. *The Bioscan* 5(1): 71–74.

### 13. TIGER BUTTERFLIES ATTRACTED TO LIGHT NEAR SIR SYED COLLEGE CAMPUS, TALIPARAMBA, KANNUR, NORTHERN KERALA, INDIA

VINAYAN NAIR<sup>1</sup>

<sup>1</sup>XV/442 A1, Nethaji Housing Colony, Trichambaram, Taliparamba P.O., Kannur 670 141, Kerala, India.

Email: vinayanpnair@gmail.com

doi: 10.17087/jbnhs/2015/v11i2i3/114435

Butterflies (Rhopalocera) based on their activity pattern in relation to light are of two types, i) diurnal butterflies, which are active during the day and rest at dusk, and ii) crepuscular forms which are active at dusk. During the night, butterflies generally rest under trees and bushes.

Occasionally, butterflies display positive phototaxis, being attracted to artificial light sources. This has been reported in literature in India. The first report was by J.I. Alfrey in notes to a paper by Best (1951), followed by Usman (1956), Donahue (1962), Shull (1964), Shull and Nadkerny (1967), Nadkerny and Shull (1968), Sharma and Chaturvedi (1999, 2005), and Nair (2001, 2004). Chowdhury and Soren (2011) provided a detailed review of butterflies attracted to light in the Indian subregion, with an inventory from West Bengal.

So far, 33 species of butterflies have been reported as positively phototactic (Chowdhury and Soren 2011; Nair 2004). Among them, Nymphalids (39.39%) outnumber the rest, followed by Pierids (21.12%), Lycaenids (18.18%),

Hesperiids (12.12%), and Papilionids (9.09%) (Chowdhury and Soren 2011; Nair 2004). The maximum number of incidents were recorded in the monsoon months (June to October) in the Indian subregion, revealing a seasonal inclination (Chowdhury and Soren 2011).

The present report is based on incidental observations in September 2015. The site was my home, 'Papilio', near the Sir Syed College campus, Taliparamba, Kannur, North Kerala, 25 km from Kannur city and 3 km east of Taliparamba (12° 04' N; 75° 39' E).

From June 2015 onwards, large congregations of tigers and crows were observed on *Crotalaria retusa* in my butterfly garden. Congregation began by 06:00 hrs and ended by 18:00 hrs and all butterflies moved away. No tigers or crows were found resting on trees or shrubs during the night. On September 05, 2015, between 19:30 hrs and 20:30 hrs it was observed that a male Dark Blue Tiger, *Tirumala septentrionis* (Butler) was attracted to a 15W CFL lamp in the bathroom

of my house. In the verandah and work area of the house there were 15W CFL and 23W CFL lamps respectively, but the butterfly directly moved to the 15W CFL lamp in the bathroom. On September 11, 2015, between 19:30 hrs and 20:30 hrs, a male Glassy Tiger *Parantica aglea* (Stoll) was found to be attracted to the 15W CFL lamp in the verandah. On September 29, 2015, at about 18:00 hrs another male Dark Blue Tiger was seen to be attracted to 23W CFL lamp in the work area. There was no rain during these hours, except for some incidental late night showers. These were unusual visitors to light. Among 'tiger' butterflies, only Striped

Tiger *Danaus genutia* (Cramer), has so far been reported as attracted to light (Donahue 1962). These observations raise the number of positively phototactic butterflies to a total of 35 in the Indian subregion in which Nymphalids dominate with a percentage of 42.85%.

### ACKNOWLEDGEMENTS

I am grateful to the Bombay Natural History Society for bringing out the DVD on 100 volumes of the *Journal*, making it easy to access the necessary articles related to this note.

### REFERENCES

- BEST, A.E.G. (1951): The butterflies of Bombay and Salsette. *J. Bombay Nat. Hist. Soc.* 50(2): 331–339.
- CHOWDHURY, S. & R. SOREN (2011): Light attracted butterflies: a review from the Indian subregion with an inventory from West Bengal, India. *Journal of Threatened Taxa* 3(6): 1868–1871.
- DONAHUE, J.P. (1962): Observations and records of butterflies attracted to light in India. *J. Lepidop. Soc.* 16(12): 131–135.
- NADKERNY, N.T. & E.M. SHULL (1968): Insects attracted to light in the Dangs, South Gujarat. *J. Bombay Nat. Hist. Soc.* 65(3): 800.
- NAIR, VINAYAN P. (2001): Butterflies attracted to light at Aralam Wildlife Sanctuary, Kerala. *Zoos' Print Journal* 16(12): 670.
- NAIR, VINAYAN P. (2004): Butterflies attracted to light near Government College Campus, Vatakara, Kerala. *J. Bombay Nat. Hist. Soc.* 101(3): 472.
- SHARMA, R.M. & N. CHATURVEDI (1999): Black Rajah *Charaxes fabius* attracted to light at Tadoba National Park. *J. Bombay Nat. Hist. Soc.* 96(1): 168–169.
- SHARMA, R.M. & N. CHATURVEDI (2005): Additions to the light attracted butterflies. *J. Bombay Nat. Hist. Soc.* 102(1): 129.
- SHULL, E.M. (1964): Butterflies attracted to light in Gujarat state, India. *J. Lepidop. Soc.* 18(30): 159–163.
- SHULL, E.M. & N.T. NADKERNY (1967): Insects attracted to mercury vapour lamp in the Surat Dangs, Gujarat State. *J. Bombay Nat. Hist. Soc.* 64(2): 256–266.
- USMAN, S. (1956): Some insects attracted to light – Part III. *J. Bombay Nat. Hist. Soc.* 53(3): 482–484.

## 14. ADDITIONS TO LARVAL HOST PLANTS OF INDIAN BUTTERFLIES (LEPIDOPTERA)

DEEPAK NAIK<sup>1,2</sup> AND MOHAMMED S. MUSTAK<sup>1,3,\*</sup>

<sup>1</sup>Department of Applied Zoology, Mangalagangothri, Mangalore University 574 199, Mangalore, Karnataka, India.

<sup>2</sup>Email: mr.deepakln@gmail.com

<sup>3</sup>Email: msmustak@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v112i3/114436

### Introduction

Butterflies are good biological indicators, hence they are suitable for biodiversity studies (Kocher and Williams 2000; Larson 1988; Sawchik *et al.* 2005). Diversity of butterflies indirectly reflects overall plant diversity in a given area, hence they are indicators to study the ecological balance in an ecosystem. Documentation of larval host plants is as important as inventorying and monitoring butterfly populations in specific sites, for the conservation of both plants and butterflies.

Kunte (2000) documented the larval host plants of butterflies in the Western Ghats region. Later he added 26 new host plants to the 420 known larval host plants from different regions of the Western Ghats (Kunte 2006). From the Kerala part of Western Ghats, Kalesh and Prakash (2007) reported 41 larval host plants of 25 species of butterflies belonging to the families Nymphalidae, Lycaenidae, and Hesperidae.

Our study was carried out in Dakshina Kannada district, Karnataka state, from 2010 to 2015. More than 138 butterfly species were documented and the life cycle of common butterflies was studied. During our observations, host plants were noted in specific localities, namely i) Puttur (12° 46' N; 75° 12' E), ii) Mangalore University Campus, Konaje (12° 55' N; 75° 54' E), and iii) Pilikula Biological Park, Mangalore (12° 49' N; 75° 55' E). In the present note, we report 13 larval host plants belonging to 10 families. These were checked against Gunthilagaraj *et al.* (1998), Veenakumari *et al.* (1998), Robinson *et al.* (2001), Balakrishnan *et al.* (2006), Kunte (2000, 2006), Kunte *et al.* (2015), Kalesh and Prakash (2007), and Kehimkar (2008), and found to be new records. The host plants were reported after successful rearing of caterpillars to ensure correct identification of the butterfly species. Scientific names of host plants were taken from Flora of South Kanara and Udupi (Bhat 2003, 2014).

**Family HesperIIDae**

1. *Erionota torus* (Evans): *Ravenala madagascariensis* Sonn., Strelitziaceae. Not a true palm; with enormous paddle-shaped leaves borne on long petioles, in a distinctive fan-shape aligned in a single plane. Usually found in gardens. Recorded from Mangalore University, Konaje, Mangalore. March 2015.

**Family Papilionidae**

1. *Papilio polymnestor* (Cramer): *Zanthoxylum ovalifolium* Wight, Rutaceae. Large glabrous shrub, armed with short prickles, on edges of small forest patches. Recorded from Puttur. August 2011.

**Family Pieridae**

1. *Eurema hecabe* (Linnaeus): *Mimosa invisa* Mart., Fabaceae. Scandent or prostrate shrub, usually found in neglected gardens and at roadsides. Recorded from Puttur, Konaje. July 2012, February 2014.

**Family Lycanidae**

1. *Arhopala centaurus* (Fabricius): *Terminalia catappa* L., Combretaceae. Large deciduous tree, often planted on roadside. Recorded from Pilikula Botanical Garden, Mangalore. November 2013.
2. *Loxura atymnus* (Stoll): *Dioscorea wallichii* Hook.f., Dioscoreaceae. Large glabrous climber, found on roadsides and on garden hedges. Recorded from Puttur. May 2012.
3. *Caleta decidia* (Westwood): *Ziziphus glaberrima* (Sedgw.) Santapau, Rhamnaceae. Scandent shrub, common along edges of forests. Recorded from Puttur. September 2011.
4. *Discolampa ethion* (Westwood): *Ziziphus oenoplia* (L.) Mill., Rhamnaceae. Common scandent shrub found in forests. Recorded from Puttur. September 2011.

**Family Nymphalidae**

1. *Mycalesis mineus* (Linnaeus): *Axonopus compressus* (Sw.) P. Beauv., Poaceae. Grass species found in gardens, arecanut plantations. Recorded from Puttur. April 2011.
2. *Melanitis leda* (Linnaeus): *Digitaria ciliaris* (Retz.) Koeler., Poaceae. Grass species found in gardens. Recorded from Puttur. October 2011.
3. *Ariadne merione* (Cramer): *Tragia hispida* Willd., Euphorbiaceae. Slender twining or trailing herb with stinging hairs, commonly found in wastelands and on roadsides. Recorded from Puttur. September 2011.
4. *Ariadne ariadne* (Linnaeus): *Tragia hispida* Willd., Euphorbiaceae. Slender twining or trailing herb with stinging hairs, commonly found in wastelands and on roadsides. Recorded from Puttur. September 2011.
5. *Moduza procris* (Cramer): *Mussaenda erythrophylla* Schumacher & Thonn., Rubiaceae. Large spreading ornamental shrub, often cultivated in gardens. Recorded from Puttur. October 2011.
6. *Neptis jumbha* (Moore): *Bauhinia acuminata* L., Fabaceae. Erect shrub, cultivated in gardens. Recorded from Puttur. March–May 2011–2013.
7. *Junonia iphita* (Cramer): *Synedrella nodiflora* Gaertn., Asteraceae. Annual erect herb, common weed on cultivated lands. Recorded from Puttur. May 2011.

**ACKNOWLEDGEMENTS**

We thank Dr. Krushnamegh Kunte for his advice and discussion. We would like to thank Prof. Deviprasad K.N., Dr. K. Gopalakrishna Bhat, and Mr. Shrikrishna Ganaraj Bhat for identification of host plants and also for their guidance. Special thanks to the Chairman, Department of Applied Zoology, Mangalore University for his support throughout the work.

**REFERENCES**

- BALAKRISHNAN, V.C., M.J. PALOT & C. RADHAKRISHNAN (2006): New host plant records of the Short-banded Sailer, *Neptis columella* (Cramer) and the Chestnut-streaked Sailer, *Neptis jumbha* (Moore) [Nymphalidae: Lepidoptera: Insecta]. *Records of Zoological Survey of India* 106(2): 125–126.
- BHAT, K.G. (2003): Flora of Udupi. Published by Indian Naturalist, Chitpady, Udupi. 350 pp.
- BHAT, K.G. (2014): Flora of South Kanara (Dakshina Kannada and Udupi district of Karnataka). Published by Aakriti Prints, Udupi. 686 pp.
- GUNTHILAGARAJ, K., T.N.A. PERUMAL, K. JAYARAM & M. GANESH KUMAR (1998): Some South Indian Butterflies. Field guide published under Project Lifescape. Indian Academy of Science, Bangalore. 270 pp.
- KALESH, S. & S.K. PRAKASH (2007): Additions to larval host plants of butterflies of the Western Ghats, Kerala, southern India (Rhopalocera, Lepidoptera): Part 1. *J. Bombay Nat. Hist. Soc.* 104(2): 235–237.
- KEHIMKAR, I. (2008): The Book of Indian Butterflies. Bombay Natural History Society and Oxford University Press, Mumbai. 497 pp.
- KOCHER, S.D. & E.H. WILLIAMS (2000): The diversity and abundance of North American butterflies vary with habitat disturbance and geography. *Journal of Biogeography* 27: 785–794.
- KUNTE, K. (2000): Butterflies of Peninsular India. Universities Press, Hyderabad and Indian Academy of Sciences, Bangalore. 254 pp.
- KUNTE, K. (2006): Addition to known larval host plants of Indian butterflies. *J. Bombay Nat. Hist. Soc.* 103(1): 119–122.
- KUNTE, K., P. ROY, S. KALESH & U. KODANDARAMAIAH (EDS) (2015): Butterflies of India. v. 2.20. Indian Foundation for Butterflies.
- LARSEN, T.B. (1988): The butterflies of the Nilgiri mountains of southern India (Lepidoptera: Rhopalocera). *J. Bombay Nat. Hist. Soc.* 85(1): 26–43.

ROBINSON, G.S., P.R. ACKERY, I.J. KITCHING, G.W. BECCALONI & L.M. HERNÁNDEZ (2001): Hostplants of the Moth and Butterfly Caterpillars of the Oriental Region. The Natural History Museum, London.

SAWCHIK J., M. DUFRENE & PH. LEBRUN (2005): Distribution patterns

and indicator species of butterfly assemblages of wet meadows in southern Belgium. *Belgian Journal of Zoology* 135(1): 43–52.

VEENAKUMARI, K., P. MOHANRAJ & P.V. SREEKUMAR (1998): Host plant utilization by butterfly larvae in the Andaman and Nicobar Islands (Indian Ocean). *Journal of Insect Conservation* 1: 235–246.

## 15. THREE NEW RECORDS OF OPISTHOBRANCHS (MOLLUSCA) FROM LAKSHADWEEP ISLANDS, INDIA

DEEPAK APTE<sup>1,3,\*</sup>, IDREES BABU<sup>2</sup> AND V.K. SALAHUDDIN<sup>1,4</sup>

<sup>1</sup>Bombay Natural History Society, Hornbill House, Shaheed Bhagat Singh Road, Mumbai 400 001, Maharashtra, India.

<sup>2</sup>Department of Science and Technology, Lakshadweep Administration, Kavaratti, Lakshadweep. Email: idreesbabu@gmail.com

<sup>3</sup>Email: spiderconch@gmail.com

<sup>4</sup>Email: salahagt@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v112i3/114437

### Introduction

The earliest work on the opisthobranch fauna of Lakshadweep Islands, India, was by Gardiner (1903), which was followed by a note by Rao *et al.* (1974), and Surya Rao and Rao (1991). Thereafter, there were no studies on opisthobranchs from these islands until recently.

The opisthobranch fauna of Lakshadweep Islands is being studied by the present authors since 2004 under the All India Co-ordinated Project on Taxonomy (AICOPTAX)-Mollusca programme supported by the Ministry of Environment, Forest and Climate Change, Government of India, and Department of Science and Technology, Lakshadweep Administration. The current count in India is approximately 350 species, of which the Lakshadweep Islands have approximately 80 species. Of these 80 species, 63 species were first reported by Apte (2009), Apte and Salahuddin (2010), and Apte and Bhave (2014). The present work reports three opisthobranch species, namely *Scyllaea pelagica*, *Goniobranchus alius*, and *Verconia norba*, of which one is a new record to India and all three are new to Lakshadweep Islands. The contributions of these studies are invaluable in understanding the diversity of these least studied molluscs from Lakshadweep Islands.

### Methodology

Surveys were conducted in the intertidal region of the eastern lagoon of Agatti Island, Lakshadweep. The specimens were collected, and after morphological study were preserved in 90% ethyl alcohol and deposited in the BNHS collections.

Many alternative classifications are currently being used on the basis of molecular studies. A modified version of the classification presented by Bouchet and Rocroi (2005) and used by World Register of Marine Species (Gofas 2009)

was followed. Unless specified, the worldwide distribution is reproduced from Gosliner *et al.* (2008).

### Results

Phylum: Mollusca

Class: Gastropoda Cuvier, 1795

Subclass: Heterobranchia Burmeister, 1837

Order: Nudibranchia Cuvier, 1817

Superfamily: Tritonioidea Lamarck, 1809

Family: Scyllaeidae Alder & Hancock, 1855

Genus: *Scyllaea* Linnaeus, 1758

***Scyllaea pelagica* Linnaeus, 1758**

**Synonyms:** *Scyllaea edwardsii* A.E. Verrill, 1878; *Scyllaea grayae* A. Adams & Reeve, 1850; *Scyllaea hookeeri* Gray M.E., 1850; *Scyllaea marmorata* Alder & Hancock, 1864; *Scyllaea pelagica* var. *marginata* Bergh, 1871; *Scyllaea viridis* Alder & Hancock, 1864.

**Size:** 15 mm (Fig. 1). Single specimen (BNHS-Opistho-639).

**Description:** *S. pelagica* is considered semi-planktonic, associated with the floating macroalgae *Sargassum* (Yonow *et al.* 2002).

Body dorsoventrally flattened; rhinophore sheaths flattened; rhinophores small; two pairs of dorsolateral lobes diagnostic, mediodorsal crest present at the posterior end of body. Body yellowish with brown mottling and some white markings; single row of brilliant blue spots visible on dorsal surface. Blue spots also present on both sides of body.

**Distribution:** Caribbean Sea, Costa Rica, Cuba, Gulf of Mexico, Mediterranean Sea, North Atlantic, Spain, Japan, France, Turkey, USA, Bahamas. The species was previously reported from India along the coast of Andhra Pradesh as

Fig. 1: *Scyllaea pelagica*Fig. 2: *Goniobranchus alius*Fig. 3: *Verconia norba*

*Scyllaea marmorata* (Alder and Hancock 1864). It was also reported from Gulf of Mannar by Farran (1905). However, Farran's work is mostly on Ceylonese nudibranchs with some study areas that are currently in Indian territory, like Gulf of Mannar. Thus, veracity of its presence in the Indian part of Gulf of Mannar could not be ascertained. This is the first record of the species from Lakshadweep.

Phylum: Mollusca

Class: Gastropoda Cuvier, 1795

Subclass: Heterobranchia Burmeister, 1837

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Goniobranchus* Pease, 1866

*Goniobranchus alius* (Rudman, 1987)

**Synonym:** *Chromodoris alius* Rudman, 1987.

**Size:** 40 mm and 35 mm (Fig. 2). Two specimens (BNHS-Opistho-641 and BNHS-Opistho-701).

**Description:** The specimens match the description by Rudman (1987) which is reproduced herewith. Creamy-white mantle with six greyish patches and small translucent pits, each with a golden-yellow spot, giving a pitted appearance. Violet border to mantle broken into a series of spots, among which is a diffused submarginal band of milky yellow. Rhinophore stalks translucent white and clubs dark brown, though in the specimen the dots are not clearly visible. Gills translucent with white edging.

**Distribution:** Endemic to the Indian Ocean along South Africa, Madagascar, Tanzania, Reunion Island, and Sri Lanka. This is the first record of the species from Lakshadweep.

Phylum: Mollusca

Class: Gastropoda Cuvier, 1795

Subclass: Heterobranchia Burmeister, 1837

Infraclass: Opisthobranchia

Order: Nudibranchia Cuvier, 1817

Superfamily: Doridoidea Rafinesque, 1815

Family: Chromodorididae Bergh, 1891

Genus: *Verconia* Pruvot-Fol, 1931

*Verconia norba* (Er. Marcus & Ev. Marcus, 1970)

**Synonym:** *Noumea norba* Er. Marcus & Ev. Marcus, 1970.

**Size:** 40 mm (Fig. 3). Single specimen (BNHS-Opistho-1234).

**Description:** Mantle pinkish orange. A broad creamy white band around mantle edge. On inside edge of this band are a series of reddish purple streaks or marks. Central part of mantle has a continuous white median band which always encircles gill pocket. Gills and rhinophores tinged orange-red. In similar

looking *Verconia purpurea* (Baba 1949) (known previously as *Noumea purpurea*), white median band runs from behind rhinophores to front of gills, but never encircles gill pockets.

**Distribution:** Indonesia and Hawaii (Rudman 1999), South Africa, Madagascar, Reunion Island, Red Sea, Gulf of Oman, Australia, Solomon Islands, Philippines, Papua New Guinea, Japan. This is the first record of the species from Lakshadweep and from India.

### Conclusion

Despite being one of the finest coral reef ecosystems in India, faunal studies in Lakshadweep Islands are limited.

Among Mollusca, opisthobranchs are least studied on these islands. The present records thus assume great significance.

### ACKNOWLEDGEMENTS

We take this opportunity to acknowledge the financial support provided by MoEFCC, Government of India under AICOPTAX-Mollusca. Dr. J.R. Bhatt, Advisor, MoEFCC is a constant source of encouragement. The project is being implemented in collaboration with the Department of Science and Technology, Lakshadweep Administration.

### REFERENCES

- ALDER, J. & A. HANCOCK (1864): Notice on the collection of nudibranchiate mollusca made in India by Walter Eliot Esq. With descriptions of several new genera and species. *Transactions of the Zoological Society of London* 5: 117–147.
- APTE, D.A. (2009): Opisthobranch fauna of Lakshadweep Islands, India with 52 new records to Lakshadweep and 40 new records to India. *J. Bombay Nat. Hist. Soc.* 106(2): 162–175.
- APTE, D.A. & V.K. SALAHUDDIN (2010): Record of *Hexabranhus sanguineus* (Rüppell & Leuckart 1828) from Lakshadweep Archipelago, India. *J. Bombay Nat. Hist. Soc.* 107(3): 261–262.
- APTE, D.A. & VISHAL BHAVE (2014): New records of opisthobranchs from Lakshadweep, India (Mollusca: Heterobranchia). *Journal of Threatened Taxa* 6(3): 5562–5568; <http://dx.doi.org/10.11609/JoTT.o3487.5562-8>.
- BOUCHET, P. & J.-P. ROCROI (2005): Classification and nomenclature of gastropod families. *Malacologia* 47(1–2): 1–397.
- FARRAN, G.P. (1905): Report on the Opisthobranchiate Mollusca collected by Prof. Herdman. Pp. 29–364. In: Herdman, W.A. (Ed.): Report on the pearl oyster fisheries of the Gulf of Mannar. The Ray Society, London.
- GARDINER, J.S. (1903): The fauna and geography of the Maldives and Laccadive Archipelagoes. Vol 2. Cambridge University Press, UK. Pp. 1080.
- GOFAS, S. (2009): Opisthobranchia. In: MolluscaBase (2017). Accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id>.
- GOSLINER, T.M., D.W. BEHRENS & Á. VALDÉS (2008): Indo-Pacific Nudibranchs and Sea Slugs: A Field Guide to the World's Most Diverse Fauna. Sea Challengers Natural History Books and the California Academy of Sciences. 425 pp.
- RAO, K.V., P. SIVADAS & L.K. KUMARY (1974): On three rare doridiform nudibranch molluscs from Kavaratti Lagoon, Laccadive Islands. *Journal of the Marine Biological Association of India* 16(1): 113–125.
- RUDMAN, W.B. (1987): The Chromodorididae (Opisthobranchia: Mollusca) of the Indo-west Pacific: *Chromodoris epicuria*, *C. aureopurpurea*, *C. annulata*, *C. coi* and *Risbecia tryoni* colour groups. *Zoological Journal of the Linnean Society* 90: 305–407.
- RUDMAN, W.B. (1999): *Noumea norba* Marcus & Marcus, 1970. In: Sea Slug Forum. Australian Museum, Sydney. Available from <http://www.seaslugforum.net/factsheet/noumnorb>. Accessed on February 13, 2016.
- SURYA RAO, K.V. & N.V. SUBBA RAO (1991): Fauna of Lakshadweep: Mollusca. State Fauna Series. Published by the Director, *Zoological Survey of India*, Calcutta. Pp. 399.
- YONOW, N., R. CHARLES ANDERSON & SUSAN G. BUTTRESS (2002): Opisthobranch molluscs from the Chagos Archipelago, central Indian Ocean. *Journal of Natural History* 36: 831–882.

## 16. FIRST RECORD OF *TITISCANIA LIMACINA* BERGH, 1890 (MOLLUSCA: GASTROPODA) FROM INDIA

DEEPAK APTE<sup>1,2,\*</sup> AND SAYALI NERURKAR<sup>1,3</sup>

<sup>1</sup>Bombay Natural History Society, Hornbill House, S.B. Singh Road, Mumbai 400 001, Maharashtra, India.

<sup>2</sup>Email: [da.apte@bnhs.org](mailto:da.apte@bnhs.org), [spiderconch@gmail.com](mailto:spiderconch@gmail.com)

<sup>3</sup>Email: [sayali\\_686@yahoo.co.in](mailto:sayali_686@yahoo.co.in)

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2i3/114438

### Introduction

Franklin *et al.* (2015) provided a comprehensive review of studies carried out on Phylum Mollusca during the past 135 years in the Andaman & Nicobar Islands. The most notable work among these is by Subba Rao (2003) and Subba Rao and Dey (2000), who reported 1,282 species of

molluscs from Andaman & Nicobar Is. More recent work is by Arumugam *et al.* (2010), Chandra and Rajan (2010), and Franklin *et al.* (2013, 2014). Some recent studies focused mainly on lesser studied opisthobranch fauna (Raghunathan *et al.* 2010a,b; Ramakrishna *et al.* 2010; Sreeraj *et al.* 2010, 2012, 2013). Despite Mollusca being one of the most studied

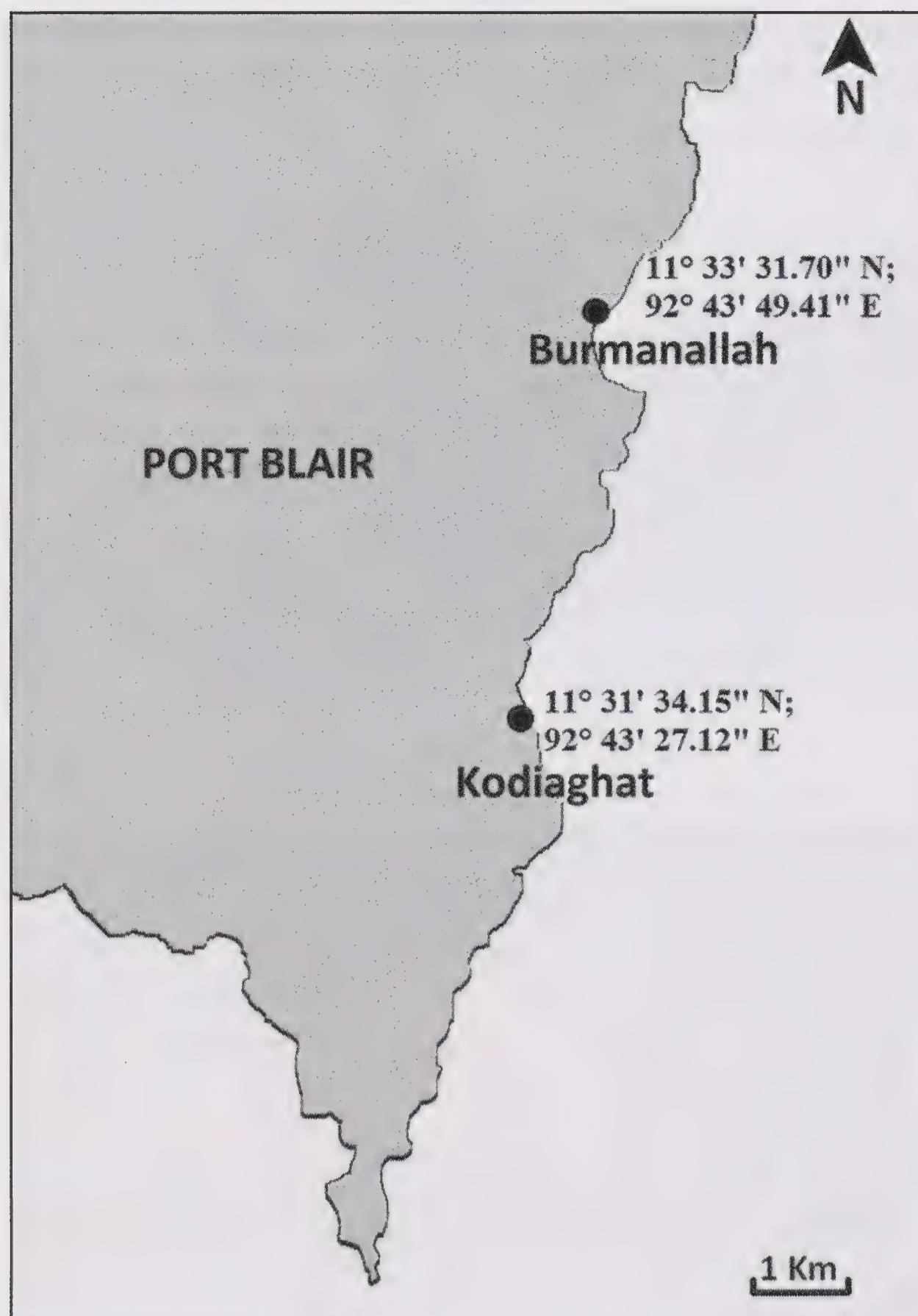


Fig. 1: Sampling locations of *Titiscania limacina*

taxa from these islands, new finds are not uncommon, suggesting that the area requires frequent systematic studies.

Phylum: Mollusca

Class: Gastropoda Cuvier, 1795

Subclass: Neritimorpha Golikov & Starobogatov, 1975

Order: Cycloneritimorpha

Superfamily: Neritopsoidea Gray, 1847

Family: Titiscaniidae Bergh, 1890

Genus: *Titiscania* Bergh, 1890

Species: *limacina* Bergh, 1890

***Titiscania limacina* Bergh, 1890**

**Present record:** Kodiaghat (11° 31' 34.15" N; 92° 43' 27.12" E), Burmanallah (11° 33' 31.70" N; 92° 43' 49.41" E) in South Andaman (Fig. 1).

Two specimens (Fig. 2a) were found crawling on coral rubble, c. 20 m away from freshwater runoff meeting the sea. The specimens were deposited in the collections of the Bombay Natural History Society (voucher nos BNHS Gastro 1611 and 1762). Thereafter, several specimens were observed from this area.

**Global Distribution:** Guam (Smith 2003), Okinawa, Japan (Kano *et al.* 2002), Mauritius, Philippines, Camiguin, Marshall Islands, Eniwetok Atoll, Mexico, Panama, Puerto Lobos, Gulf of California (Marcus and Marcus 1967), Egypt, Red Sea (Rudman 2008), Galapagos (Templado and Ortea 2001), Australia (Burn 1975; Loch 1975), Indonesia (Burghardt *et al.* 2006), French Polynesia, Vanuatu, Costa Rica, Guam (GBIF 2013), Moluccas (Strack 1998).

**Taxonomic Status:** Order Cycloneritimorpha comprises more than 450 living species classified into six superfamilies, namely Helicinoidea Férussac, 1822, Hydrocenoidea Troschel, 1857; Naticopsoidea Waagen, 1880†; Neritoidea Rafinesque, 1815; Neritopsoidea Gray, 1847; and Symmetrocapuloidea Wenz, 1938† (Bouchet 2011; Fretter 1965; Ponder 1998). Bergh (1890) established the family Titiscaniidae for the sole species *Titiscania limacina*, emphasizing the absence of the post-larval shell, complete limacization, and the animal's slug-like appearance. Subsequently, another species *Titiscania shinkishihataii* Taki, 1955 was described from Japan (Saito and Tsuchiya 1990). Previously, Genus *Titiscania* was a poorly known group (Ponder 1998). The radular and anatomical characteristics of *Titiscania* are almost identical to those of *Neritopsis*, except those modified in relation to limacization (Kano 1999). Based on molecular data *Titiscania* is in fact a highly specialized offshoot of the Neritopsidae, and thus Kano *et al.* (2002) produced a phylogeny of the Recent Nentimorpha recognizing four clades: Hydrocenidae; Helicinidae + Neritiliidae; Neritidae + Phenacolepadidae; Neritopsidae + Titiscaniidae from the standpoint of cladistics.

Bouchet and Rocoli (2005) ranked the resulting clades from Kuno *et al.* (2002) as superfamilies and Neritopsidae along with Titiscanidae included within superfamily Neritopsoidea.

**Description**

A bluish white, thread-like substance is discharged when the animal is disturbed, through defensive glands placed on the back. A row of about 12 densely placed white papillae are present on both sides of the back. Other morphological characters match the specimens described by Bergh (1890) and Marcus and Marcus (1967).

**Radula** (Fig 2: b–d): Radula of *Titiscania limacina* is rhipidoglossate type with absence of median rachidian tooth along with two inner lateral teeth on either side in each row (hence placed in Superfamily Neritopsoidea) exhibiting dental formula n-3-3-n (n=100-110). It comprises about 210 rows [Bergh (1890) 180–205; Marcus and Marcus (1967): 220]. The first lateral tooth (L3) is flattened with short folded pointed hook, second lateral tooth (L4) is also flattened but without hook. The fifth lateral tooth (L5) is thickened, folded,

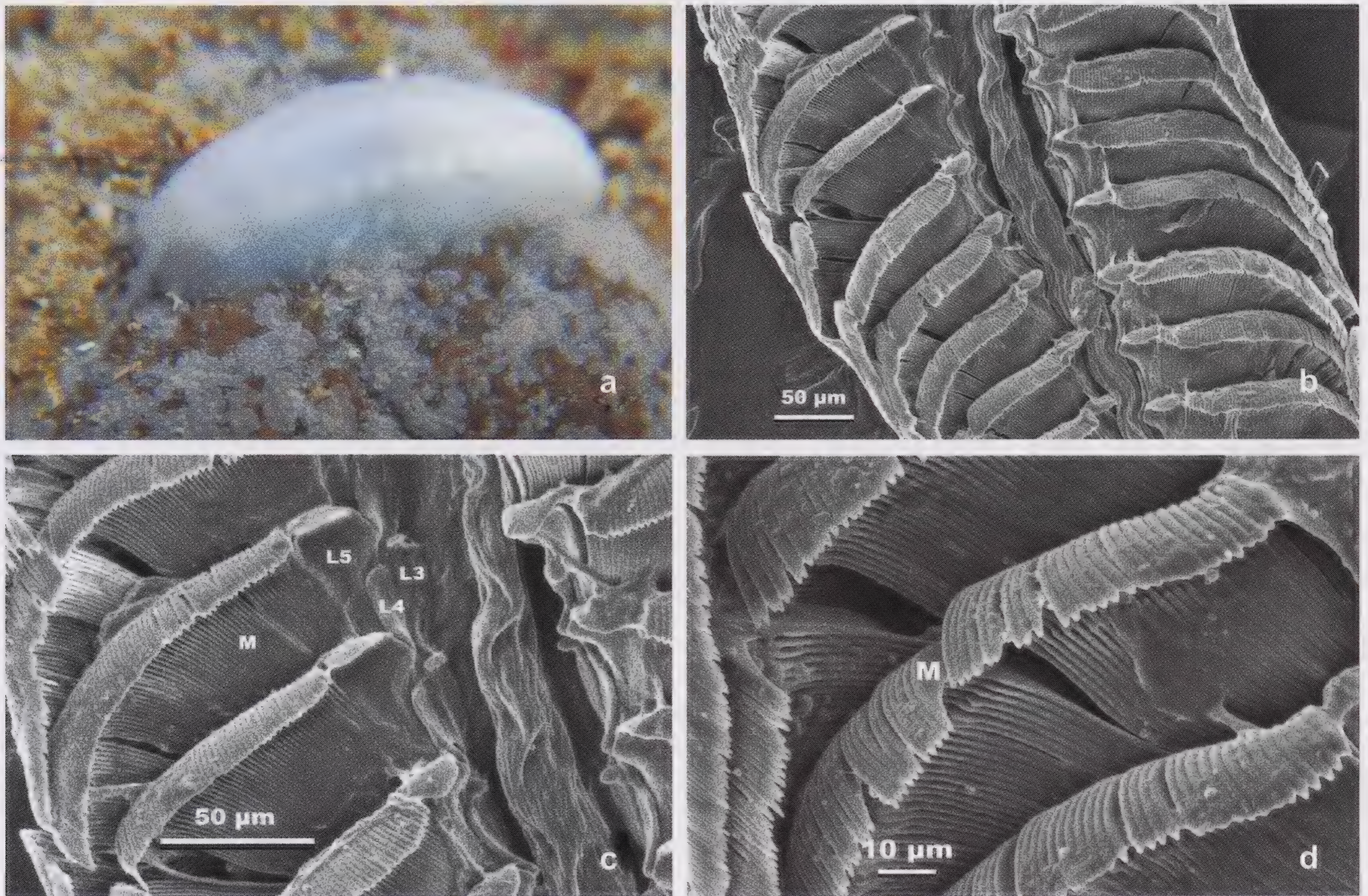


Fig. 2: a. *Titiscania limacina*. b–d: Electron micrographs of radula of *T. limacina*. b. Dorsal view. c. Enlarged view of left row of radula teeth. d. Enlarged view showing marginal teeth.

Abbreviations: L3–L5: third to fifth lateral teeth; M: Marginal teeth

with wide blunt hook. L5 is larger than L3 and L4, which is typical of Neritopsid radula. Marginal teeth (M) are more or less oblique, sharply curved, hook-like structures with narrow, pointed base.

### Habits and Habitat

The observed animals were found to be active during dusk and dawn, and remained under loose rocks during day time. The habitat in Burmanallah is mostly dominated by degraded coral reef with coral rubble and silt, while in Kodiaghat it is dominated by rocky shore with scattered patches of corals, coral sand and silt. These areas are not part of the protected area network of Andaman & Nicobar.

*Titiscania limacina* is being recorded for the first time

from Indian waters, making this a valuable contribution to the molluscan fauna of India.

### ACKNOWLEDGEMENTS

We appreciate and acknowledge the Ministry of Environment, Forest and Climate Change (GOI) and Whitley Fund for Nature for providing financial support. We wish to thank Mr. Sumantha Narayana and team working in Andaman archipelago for the field work. We are also grateful to Department of Forests and Environment, Andaman and Nicobar Islands and Mr. Shinde, Technical Expert, Physics Department, Savitribai Phule University, Pune for his assistance in Scanning Electron Micrography of radula of *T. limacina*.

### REFERENCES

- ARUMUGAM, M., A. SHANMUGAM, T. BALASUBRAMANIAN, L. KANNAN & S. AJMALKHAN (2010): Studies on molluscan diversity of Great Nicobar island - a pre tsunami scenario. Pp. 275–282. *In*: Recent Trends in Biodiversity of Andaman and Nicobar Islands (Eds: Ramakrishna, R.C. Raghunathan and C. Sivaperuman). Zoological Survey of India, Kolkata.
- BERGH, R. (1890): Die Titiscanien, eine Familie der rhipidoglossen

- Gastropoden. *Morph. Jahrbuch* 16: 1–26 + pl. 1–3.
- BOUCHET, P. (2011): Cycloneritimorpha. *In*: MolluscaBase (2016). Accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=394185> on January 21, 2017.
- BOUCHET, P. & J.-P. ROCROI (2005): Classification and nomenclator of gastropod families. *Malacologia* 47(1–2): 1–397.

- BURGHARDT, INGO BOCHUM, ROSANA CARVALHO MANADO, DIRK EHEBERG MÜNCHEN, GREVO GERUNG MANADO, FONTJE KALIGIS MANADO, GUSTAF MAMANGKEY MANADO, MICHAEL SCHRÖDL MÜNCHEN, ENRICO SCHWABE MÜNCHEN, VERENA VONNEMANN BOCHUM & HEIKE WÄGELE BOCHUM (2006): Molluscan diversity at Bunaken National Park, Sulawesi. *J. Zool. Soc. Wallacea* 2: 29–43.
- BURN, R. (1975): *Titiscania limacina* Bergh, 1875, an unusual gastropod new to Australia. *Australian Shell News* 11: 1.
- CHANDRA, K. & P.T. RAJAN (2010): Biodiversity of Barren Island, Andaman and Nicobar Islands. Pp. 299–312. *In: Recent Trends in Biodiversity of Andaman and Nicobar Islands*. (Eds: Ramakrishna, R.C. Raghunathan and C. Sivaperuman) Zoological Survey of India, Kolkata.
- FRANKLIN, J.B., P. VENKATESHWARAN, N.V. VINITHKUMAR & R. KIRUBAGARAN (2013): Four new records of family Conidae (Caenogastropoda: Mollusca) from Andaman Islands. *Zootaxa* 3635(1): 81–86.
- FRANKLIN, J.B., N.V. VINITHKUMAR & R. KIRUBAGARAN (2014): Two new records of marine Gastropods from Andaman and Nicobar Islands, India. *Marine Biodiversity Records* 7(41): 1–5.
- FRANKLIN, J.B., N.V. VINITHKUMAR & R. KIRUBAGARAN (2015): Discovery of marine molluscs from the Andaman and Nicobar Islands: past, present and prospects. *Journal of the Andaman Science Association* 20(1): 27–35.
- FRETTER, V. (1965): Functional studies of the anatomy of some neritid prosobranchs. *J. Zool. Lond.* 147: 46–74.
- GBIF (2013): GBIF Secretariat: GBIF Backbone Taxonomy. July 01, 2013. Accessed via <http://www.gbif.org/species/2293667> on March 29, 2016.
- KANO, Y. (1999): Comparative anatomy and systematics of *Pisulina* (Gastropoda: Neritopsina) from marine caves. M.Sc. thesis. University of Tokyo, Japan.
- KANO YASUNORI, SATOSHI CHIBA & TOMOKI KASE (2002): Major adaptive radiation in neritopsine gastropods estimated from 28S rRNA sequences and fossil records. *Proc. R. Soc. Lond. B.* 269. Pp. 2457–2465. doi: 10.1098/rspb.2002.2178.
- LOCH, I. IAN (1975): OZCAM - Online Zoological Collections of Australian Museums Provider. <http://biocache.ala.org.au/occurrences/81a4cc2a-bae2-42dd-abae-53e7f48d0ff7>.
- MARCUS, E. & E. MARCUS (1967): American opisthobranch molluscs. *Studies in Tropical Oceanography* 6: 1–256.
- PONDER, W.F. (1998): Superorder Neritopsina. Pp. 693–702. *In: Mollusca: the southern synthesis*. (Eds: Beesley, P.L., G.J.B. Ross & A. Wells). Fauna of Australia. Vol. 5. CSIRO, Melbourne, Australia.
- RAGHUNATHAN, C., C. SIVAPERUMAN & RAMAKRISHNA (2010): An account of newly recorded five species of Nudibranch (Opisthobranchia, Gastropoda) in Andaman and Nicobar Islands. Pp. 283–288. *In: Recent Trends in Biodiversity of Andaman and Nicobar Islands* (Eds: Ramakrishna, R.C. Raghunathan and C. Sivaperuman). Zoological Survey of India, Kolkata.
- RAMAKRISHNA, C.R., C. SREERAJ, C. RAGHUNATHAN, J.S. SIVAPERUMAN & Y. KUMAR (2010): Guide to Opisthobranchs of Andaman and Nicobar Islands. Zoological Survey of India Publications. Pp. 1–196.
- RUDMAN, W.B. (2008) (August 16): *Titiscania limacina* Bergh, 1875. *In: Sea Slug Forum*. Australian Museum, Sydney. Available from <http://www.seaslugforum.net/factsheet/titiscania>. Accessed on November 15, 2015.
- SAITO, H. & K. TSUCHIYA (1990): Rediscovery of *Titiscania shinkishihataii* Taki, 1955. *Chiribotan* 21(3): 45–47. (In Japanese)
- SMITH, B.D. (2003): Prosobranch gastropods of Guam. *Micronesica* 35–36: 244–270.
- SREERAJ, C.R., P.T. RAJAN, R. RAGHURAMAN, C. RAGHUNATHAN, R. RAJKUMAR, T. IMMANUEL & RAMAKRISHNA (2010): On some new records of sea slugs (Class: Gastropoda, Subclass: Opisthobranchia) from Andaman and Nicobar Islands. Pp. 289–298. *In: Recent Trends in Biodiversity of Andaman and Nicobar Islands* (Eds: Ramakrishna, R.C. Raghunathan, and C. Sivaperuman). Zoological Survey of India, Kolkata.
- SREERAJ, C.R., C. SIVAPERUMAN & C. RAGHUNATHAN (2012): An annotated checklist of opisthobranch fauna (Gastropoda: Opisthobranchia) of the Nicobar Islands, India. *Journal of Threatened Taxa* 4(4): 2499–2509.
- SREERAJ, C.R., C. SIVAPERUMAN & C. RAGHUNATHAN (2013): Species diversity and abundance of opisthobranch molluscs (Gastropoda: Opisthobranchia) in the coral reef environments of Andaman and Nicobar Islands, India. Pp. 81–106. *In: Ecology and Conservation of Tropical Marine Communities* (Eds: Venkataraman, K., C. Raghunathan, and C. Sivaperuman). Springer. 481 pp.
- STRACK, H.L. (1998): The Rumphius Biohistorical Expedition. A story of present and past marine biology. *Vita Marina* 45(1–2): 17–40.
- SUBBA RAO, N.V. (2003): Indian Seashells (Part-I): Polyplacopora and Gastropoda. *Records of the Zoological Survey of India, Occasional Publications*. Hooghly Printing Co. Ltd, Kolkata. Pp. 416.
- SUBBA RAO, N.V. & A. DEY (2000): Catalogue of Marine Molluscs of Andaman and Nicobar Islands. *Records of the Zoological Survey of India, Occasional Publications*. Hooghly Printing Co. Ltd, Kolkata. Pp. 323.
- TEMPLADO, J. & J. ORTEA (2001): The occurrence of the shell-less neritacean gastropod *Titiscania limacina* in the Galapagos Islands. *Veliger* 44: 404–406.

# 17. *PORTULACA GRANULATO-STELLULATA* (POELLN.) RICCERI & ARRIGONI: A NEW RECORD FOR FLORA OF GUJARAT, INDIA

RUPESH MAURYA<sup>1,2</sup>, UMERFARUQ M. QURESHIMATVA<sup>1,3,\*</sup>, JAIVIN PATEL<sup>1,4</sup> AND HITESH SOLANKI<sup>1,5</sup>

<sup>1</sup>Department of Botany, USS, Gujarat University, Ahmedabad 380 009, Gujarat, India.

<sup>2</sup>Email: rupesh.maurya543@gmail.com

<sup>3</sup>Email: ufmqureshi@yahoo.in

<sup>4</sup>Email: pateljaivin94@gmail.com

<sup>5</sup>Email: husolanki@yahoo.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2/114439

## Introduction

The genus *Portulaca* L. is widely represented in tropical flora. The taxonomic consistency of *Portulaca oleracea* L.

is not well-defined as its vegetative parts do not provide any stable diagnostic characters. Recently seed morphology has been used as one of the key diagnostic characters (Domina

Gianniantonio and Raimondo 2009). *Portulaca oleracea* L. has been divided into several microspecies based on seed characters, such as seed size and surface morphology of the seed (Dannin *et al.* 2008).

During a field survey in 2015–16, a few specimens of *Portulaca* were collected from Kalsar village, Ghoghamba taluka, Panchmahal district (22° 45' N; 73° 36' E, area: 5,083.14 sq. km), Gujarat. Critical examination of these specimens confirmed the identity as *Portulaca granulato-stellulata* (Poelln.) Ricceri & Arrigoni. This species has not been reported in the literature from Gujarat (Cook 1901–1908; Dastur and Saxton 1922; Meena and Pandey 2004; Parmar 2012; Raghvan 1981; Santapau 1962; Saxton and Sedgwick 1918; Shah 1978; Yogi 1970) and therefore it forms a new distributional record for Gujarat state. Voucher specimen RM-543 is deposited in Department of Botany, Gujarat University, Ahmedabad, India.

#### *Portulaca* L.

#### Key to species

1. Testa cells flat devoid of emergences, star-shaped ..... *Portulaca oleracea*
1. Testa cells star-shaped, papillae emerging from rays ..... *Portulaca granulato-stellulata*

*Portulaca granulato-stellulata* (Poelln.) Ricceri & Arrigoni in *Parlatorea* 4: 93 (2000).

Synonyms:

*Portulaca oleracea* var. *granulatostellulata* Poelln. in *Occ. Pap. Bernice Pauahi Bishop Mus.* 12(9): 5(1936),

*Portulaca oleracea* subsp. *granulatostellulata* (Poelln.) Danin & H.G. Baker in *Israel J. Bot.* 27: 189(1979).

Annual or perennial, prostrate or erect. Branches and stem with 3–20 mm rarely up to 50 mm long internodes. Leaves alternate, closely crowded below the flowers, spatulate or obovate-oblong. Inflorescence cymose, with clusters of 3–6 flowers subtended by 4-leaved involucre. Sepals subequal, basally united into a short, 2–3 mm long tube, keeled; lobes 2–3 mm long, margin broad membranous, acute, deciduous. Petals 5, deliquescent, slightly united at the base, obovate, 5–6 mm long, 2.5–3 mm wide, yellow, emarginate with mucronulate notch. Capsule 30–32 seeded, seeds black, papillae like projections on seed surface, small seed size (length less than 0.85 mm).

**Flowers and fruits:** Throughout the year.

**Exsiccata:** RM-543.

#### ACKNOWLEDGEMENT

The authors are thankful to the Department of Forensic Science, USS, Gujarat University, for providing microscope.

#### REFERENCES

- DOMINA GIANNIANTONIO & F.M. RAIMONDO (2009): A new species in the *Portulaca oleracea* aggregate (Portulacaceae) from the Island of Soqotra (Yemen). *Webbia* 64: 9–12.
- COOKE, T. (1901–1908): The Flora of the Presidency of Bombay. Vols 1–3. Taylor & c. Francis, London.
- DANIN A., DOMINA & F.M. RAIMONDO (2008): Microspecies of the *Portulaca oleracea* aggregate found on major Mediterranean islands (Sicily, Cyperus, Crete, Rhodes) *Fl. Medit.* 18: 89–107.
- DASTUR, R.H. & W.T. SAXTON (1922): Ecology of plant communities in the Savannah formation of Gujarat. *J. Indian Bot. Soc.* 2: 35–50.
- RAGHVAN, R.S., B.M. WADHWA, M.Y. ANSARI & R.S. RAO (1981): A check list of plants of Gujarat. *Botanical Survey of India XXI* (2): 1–128.
- MEENA, S.L. & PANDEY R.L. (2004): A reassessment of the phytodiversity of Gujarat state: Floristic composition and floristic analysis, vegetation, threatened and rare taxa and their conservation strategies. *Journal of Economic and Taxonomic Botany* 28(4): 867–894.
- SHAH, G.L. (1978): Flora of Gujarat State. Sardar Patel University, Vallabh Vidhyanagar, Gujarat. Vols 1–2.
- SANTAPAU, H. (1962): The Flora of Saurashtra. Part 1. Rajkot.
- SAXTON, V.J. & L.F. SEDGWICK (1918): Plants of Northern Gujarat. *Rcc. Bat. Sure. Ind.* 6(7): 210–323.
- YOGI, D.V. (1970): A contribution to the Flora of North Gujarat. Ph.D. Thesis, Sardar Patel University, Vallabh Vidyanagar.

### 18. ADDITIONS TO THE FLOWERING PLANTS OF GOA, INDIA

SHARAD S. KAMBALE<sup>1,2</sup>, ANUP S. DESHPANDE<sup>1,3,\*</sup> AND RAVIKIRAN S. PAGARE<sup>1,4</sup>

<sup>1</sup>Department of Botany, Goa University, Taleigao Plateau 403 206, Goa, India.

<sup>2</sup>Email: ceropegias1987@gmail.com

<sup>3</sup>Email: anoopdesb@gmail.com

<sup>4</sup>Email: ravikiran.pagare@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2i3/114440

#### Introduction

While surveying the Goa University Campus to document angiosperms, the authors collected *Desmodium scorpiurus* (Sw.)

Poir. and *Ipomoea triloba* L. which were not reported earlier from the state of Goa (Datar and Lakshminarasimhan 2013; Datar *et al.* 2005; Joshi *et al.* 1997; Naithani *et al.* 1997; Rao 1986).

*Desmodium* Desv. (Leguminosae) is represented by c. 275 species worldwide and in India by 47 species, seven subspecies and five varieties (Sanjappa 1992), of which eight species are known from Goa (Rao 1986). Some *Desmodium* spp. are of medicinal value, and locally used as fodder and green manure (Mabberley 2008).

*Ipomoea* L. (Convolvulaceae) is represented by c. 650 species distributed in warm temperate and tropical regions of the world (Mabberley 2008). In India, the genus is represented by c. 63 species (Santapau and Henry 1973), of which 15 are known from Goa (Rao 1986).

*Desmodium scorpiurus* (Sw.) Poir. Dict. Sci. Nat., ed. 2 (13): 110. 1819.

**Specimens examined:** INDIA: Goa, North Goa, Goa University Campus. 25.ix.2015, S.S. Kambale 360. Deposited in Herbarium, Department of Botany, Goa University, Goa.

Prostrate to decumbent herbs. Stem angled, scabrid, grooved, and hairy throughout. Leaves stipulate, trifoliate, alternate; leaflets 2.0–7.5 x 1.0–4.0 cm, ovate-oblong or elliptic-oblong, rounded at base, obtuse at apex, sparsely hairy on either sides, young leaves pubescent. Petiole 3.5–4.0 cm long, channelled, puberulous; petiolule 1.0–2.0 mm long; stipule orbicular, hairy along margin; stipels linear, on either sides of petiolule, puberulous. Inflorescence terminal and axillary racemes. Flowers white and pink. Pods moniliform, 3.0–5.0 cm long, covered with hooked hairs. Seeds yellow to pale brown, rhomboid.

**Fl. & Fr.:** September–March.

**Distribution:** Native to Mexico, Central & South America, West Indies, and Peru. In India, it is spreading in the states of Goa, Karnataka, Kerala, and Maharashtra.

**Notes:** An exotic species and seems to be introduced and naturalised in the Asia-Pacific region (Ohashi 1973). It was reported from India by Tandyekkal and Mathew (1995) from Kozhikode and Ernakulum districts in Kerala, and by Vartak and Kumbhojkar (1984) from Maharashtra. It is now naturalized in Goa, and is spreading along the Western Ghats. Individual plants with white and pink flowers are seen growing together.

**Habitat:** It was found growing abundantly in open unused areas.

*Ipomoea triloba* L. Sp. Pl. 1: 161. 1753.

**Specimen Examined:** INDIA: Goa, North Goa, Goa University Campus. 01.x.2015, S.S. Kambale 372. Deposited in Herbarium, Department of Botany, Goa University, Goa.

Extensive twining herb; stem 1.5–2.5 m long, glabrous to sparingly hispid (at nodes). Leaves petiolate; petiole 2.3–12.5 cm long, channelled, glabrous; leaf lamina broadly ovate-orbicular, 2.5–8.5 x 2–8 cm, 3-lobed, cordate at base, basal lobes angular to entire, glabrous to sparsely hairy on both surfaces. Inflorescence axillary cyme; peduncles 5–16 cm long, glabrous to slightly verrucose at apex, 3- to many-flowered; flowers aggregate; pedicel minutely verrucose, 0.5–1.0 cm long. Calyx unequal, 0.7–1.0 cm long, mucronulate at apex. Corolla funnel-shaped, 1.5–2.0 cm long, glabrous, pink. Capsules globose. Seeds glabrous to rarely pubescent.

**Fl. & Fr.:** September–November.

**Distribution:** Argentina, Bolivia, Brazil, Paraguay and Uruguay. INDIA: Gujarat, Jharkhand, Kerala, Karnataka, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal. This native of Tropical America (Magesh *et al.* 2012) is now naturalized in the aforementioned states.

**Note:** *Ipomoea triloba* is spreading in the state of Goa and is abundant in the Goa University Campus.

## ACKNOWLEDGEMENTS

The authors thank Dr. V.B. Shimpale, New College, Kolhapur, for confirming the identity of *Ipomoea triloba* and Dr. K.N. Gandhi, Harvard University Herbaria, USA, for confirmation of the correct author citation for *Desmodium scorpiurus*. The authors are grateful to Prof. M.K. Janarthanam and Head, Department of Botany, Goa University, Goa, for providing necessary facilities. SSK thanks University Grants Commission for financial assistance (F.4-2/2006 (BSR)/BL/14-15/0489 dated 1st July, 2015).

## REFERENCES

- DATAR, M.N. & P. LAKSHMINARASIMHAN (2013): Flora of Bhagwan Mahavir (Molem) National Park and Adjoinings, Goa. Botanical Survey of India, Kolkata.
- DATAR, M.N., R. MANIKANDAN, P. LAKSHMINARASIMHAN & P.S.N. RAO (2005): New plant records for Goa and Karnataka. *Rheedea* 15: 133–135.
- JOSHI, V.C., S. RAJKUMAR & M.K. JANARTHANAM (1997): Additions to the Dicotyledonous Flora of Goa. *J. Econ. Taxon. Bot.* 21: 495–500.
- MABBERLEY, D.J. (2008): Mabberley's Plant Book. A portable dictionary of plants, their classification and uses. 3rd edn. Cambridge University Press, Cambridge.
- MAGESH, C.R., P. LAKSHMINARASIMHAN & P. VENU (2012): New plant records for Jharkhand. *Zoos' Print* (5): 24–25.
- NAITHANI, H.B., K.C. SAHNI & S.S.R. BENNET (1997): Forest Flora of Goa. International Book Distributors, Dehradun.
- NAYAR, T.S., A. RASIYA BEEGAM & M. SIBI (2014): Flowering plants of the Western Ghats, India. Jawaharlal Nehru Tropical Botanical

Garden and Research Institute, Thiruvananthapuram, Kerala.  
 OHASHI, H. (1973): The Asiatic species of *Desmodium* and its allied genera (Leguminosae). *Ginkgoana*, Tokyo. Pp. 95–97.  
 RAO, R.S. (1986): Flora of Goa, Diu, Daman, Dadra & Nagarhaveli. Flora of India. Series 2. Vol. II. Botanical Survey of India, Kolkata.  
 SANJAPPA, M. (1992): Legumes of India. Bishen Singh Mahendra Pal Singh, Dehradun. Pp. 149–166.  
 SANTAPAU, H. & A.N. HENRY (1973): A Dictionary of the Flowering

Plants in India. Council of Scientific & Industrial Research, New Delhi. Pp. 83.  
 TANDYEKKAL, D. & P. MATHEW (1995): *Desmodium scorpiurus* (Swartz) Desvaux (Leguminosae-Papilionoideae): a new record for India. *Rheedea* 5(2): 177–179.  
 VARTAK, V.D. & M.S. KUMBHOJKAR (1984): Occurrence of *Desmodium scorpiurus* (Swartz) Desvaux in Western India. *J. Bombay Nat. Hist. Soc.* 81(1): 224–226.

## 19. VIRAL DISEASES OF FOUR TREE SPECIES IN FOREST NURSERIES OF INDORE, INDIA

HEMANT PATHAK<sup>1,\*</sup> AND S.C. SILAWAT<sup>2</sup>

<sup>1</sup>Forest Research and Extension Circle, Khandwa Road, Indore 452 017, Madhya Pradesh, India. Email: Hemantpathak777@gmail.com

<sup>2</sup>Forest Research and Extension Circle, Malwa Demo Nursery, Khandwa Road, Indore 452 001, Madhya Pradesh, India.

Email: Satishsilwat.ifs87@gmail.com

\*Corresponding author

doi: 10.17087/jbnhs/2015/v11i2i3/114441

### Introduction

The Research and Extension Circle of Forest Department of Madhya Pradesh has been working towards forest management for many years. The Research and Extension Circle maintains many nurseries in which forest plant species are cultivated through seedlings and culms, planted in polythene bags.

In these nurseries, viral diseases such as leaf mosaic, leaf curl, and leaf shrink are seen affecting plants. Plant diseases caused by viruses are mostly systemic in nature, and though seldom lethal, are responsible for losses in plant yield and quality. Although the entire plant is infected, only a few plant parts exhibit symptoms. Symptoms may often be characteristic for a specific virus on a specific host. An array of symptoms along with other criteria are used to identify viral diseases. Generally, leaves exhibit the majority of the symptoms. In some cases, shoots, floral organs, or even roots show symptoms.

In the present study, we observed specific and widespread pathological problems on tree species in the forest nurseries of Indore district due to viral pathogens. Viral infections were commonly found on *Dalbergia latifolia* (Roxb.), *Thespesia populnea* (L.), *Duranta erecta* (L.), and *Bauhinia purpurea* (L.).

### Material and Methods

The headquarters of Research and Extension Circle of forest the department, situated at Malwa Demo Nursery in Khandwa Road, and Residency Nursery, Indore were selected to observe viral-infected plant species. The nurseries were observed monthly during 2014–15. Most infected plants were found between March and September 2015. Most viruses are beyond the resolution capacity of a light microscope, so identification of the disease was done on the

basis of changes in external morphology or abnormality of plant parts.

### Results and Discussion

*Dalbergia latifolia* (Roxb.) is a deciduous timber tree native to the Indian Subcontinent and southern Iran. Its wood is used in the construction industry and for fuel. The heartwood is durable and resistant to attack by termites and fungi. During our surveys, leaves of *Dalbergia latifolia* were found infected in about 70–80% of the total plant population. The leaves are normally alternate, odd-pinnate with 5–7 unequal sized leaflets originating from the same rachis. The leaflets are broadly obtuse, dark green above and pale below (Orwa *et al.* 2009). In infected plants, we found that the leaf margins were rolled inwards. The lower surface of infected leaves turned black, and black patches developed on the upper surface (Figs 1 & 2). Highly infected leaves were completely curled towards the primary vein.

*Thespesia populnea* (Linn.) is a medium-sized evergreen tree, up to 20 m tall with a dense crown. It has greyish bark and the twigs are densely covered with brown to silvery scales, heart-shaped leaves, and cup-shaped yellow flowers that are produced intermittently throughout the year in warm climates. In the trees we observed, the leaves were found infected by leaf curl virus. Infected leaves had curled upwards and shrunk (Fig. 3). During another observation conducted in Vijaynagar area, Indore, young leaves of *Thespesia populnea* were found to be highly infected with leaf curl disease (Fig. 4), and had turned red in colour and twisted in shape.

*Duranta erecta* (Linn.), commonly known as Golden Dewdrop (family Verbenaceae) is a large, flowering shrub, grown as an ornamental hedge plant in gardens. In

Fig. 1: Infected leaves of *Dalbergia latifolia*Fig. 2: Infected plants of *Dalbergia latifolia* in nurseryFig. 3: Infected plants of *Thespesia populnea* in nurseryFig. 4: Infected plants of *Thespesia populnea*Fig. 5: Infected leaves of *Duranta erecta*Fig. 6: Infected leaves of *Bauhinia racemosa*

our survey during March–October 2015, yellow mosaic virus disease was observed on *D. erecta* in the nurseries of Indore, India. Symptoms observed in the leaves were reduction in size, upward leaf curl, and chlorosis (Fig. 5). This disease was first observed on *Duranta erecta* by Jaidi *et al.* (2015) at Lucknow, India. The symptoms we observed are reminiscent of a begomovirus infection

reported previously on *D. erecta* in Pakistan (Iram *et al.* 2004), hence a similar infection was suspected.

*Bauhinia purpurea* (Linn.) is a small to medium-sized flowering ornamental deciduous tree with a short bole and spreading crown, attaining a height of up to 15 m and trunk diameter of 50 cm. Symptoms of disease observed in the leaves of *Bauhinia purpurea* were similar to leaf curl disease

of *D. erecta*. In *Bauhinia purpurea* the leaf lamina is broadly ovate to circular, but in infected leaves the size of lamina was reduced and the leaf margin was distorted (Fig. 6).

### Conclusion

Viral pathogens cause significant losses in forest nurseries. Therefore, a study on these pathogens and finding solutions to eradicate them is of utmost importance. In the current study, four tree species were found infected: *Dalbergia latifolia*, *Thespesia populnea*, *Duranta erecta*, and *Bauhinia purpurea*.

From the symptom, the disease was identified to be viral. During this work, first time *Dalbergia latifolia* was found infected by viral disease, in Forest Research and Extension Nurseries (survey site) of Indore, India.

### ACKNOWLEDGEMENT

The authors are thankful to the Forest Research and Extension Circle, Indore for permission to conduct the experiments.

### REFERENCES

- IRAM, S., L. AMRAO, M.S. MANSOOR, A.H. MALIK, R.W. BRIDDON & Y. ZAFAR (2004): First report of a begomovirus associated with leaf curl disease of *Duranta erecta* in Pakistan. *Plant Pathology* 54: 260.
- JAIDI, M., S. KUMAR, A. SRIVASTAVA & S.K. RAJ (2015): First report of

*Clerodendron yellow mosaic virus* on golden dewdrop (*Duranta erecta*) in India. *New Disease Reports* 32: 12.

- ORWA, C., A. MUTUA, R. KINDT, R. JAMNADASS & S. ANTHONY (2009): Agro forest tree Database: a tree reference and selection guide version 4.0. World Agroforestry Centre, Kenya. Pp. 1–5.





## INSTRUCTIONS TO AUTHORS

The *Journal* welcomes concise reports of original research in natural history, taxonomy and other aspects of zoology and botany of general interest.

### SUBMISSION OF MANUSCRIPT

Manuscripts should be submitted as Word documents (.doc) or RTF (.rtf) files. Figures may be uploaded separately or embedded into the text of your initial submission. On acceptance, you will be required to upload your manuscript as one text file and additional high resolution graphics files in TIFF (.tiff). Please ensure that the track changes feature has been turned off and any reviewing notes removed before submission or they will be visible throughout the review process.

If a new taxon is described, the institution in which the type material is deposited must be given, together with details of the registration assigned to it; the specimen should be deposited in a National Depository. Full binomial names should be given on the first occasion an organism is mentioned (and abbreviated thereafter), except at the beginning of a sentence. Avoid footnotes except to add information below the body of a table. Do not use initial capitals for the common names of animals unless derived from a proper noun.

Revised manuscripts must be submitted in their final form within two months of receipt of a revision letter from the Editor.

### PREPARATION OF MANUSCRIPT

#### Main Papers and New Descriptions

Manuscripts of papers for the Main section and New Descriptions should be as concise as possible and must be typed in double spacing. The text should run in one, single column and have generous margins. Pages should be numbered consecutively, and the matter on Page 1 should be arranged in the following order: Title of the paper; Name(s) of Author(s), Department(s) and Institution(s) [in case of multiple affiliations, author(s) should specify current affiliation]; Footnote containing address of Author for correspondence with e-mail id, followed by the List of Abbreviations used in text. A short running title derived from the original title may also be given for main papers. Page 2 should contain the Abstract. The text may be arranged in the following order: Introduction; Material and Methods or Methodology; Results; Discussion; Acknowledgements; References. Abstract, Key Words, Tables and Captions for Figures should be typed separately.

**Title:** The title should be such as to be useful for indexing and information retrieval.

**Abstract:** The abstract, not exceeding 200 words, should indicate the scope and significant content of the paper, highlighting the principal findings and conclusions.

**Introduction:** The introductory part should bear no heading, should be brief and state precisely the objective of the study in relation to the present status of knowledge in the field. Review of literature should be restricted to the essential references

**Material and Methods or Methodology:** The nomenclature, sources of material and the procedures should be clearly stated. New methods should be described in detail, but if the methods are well known, a mere reference to them will do; any modifications made in the methods should be stated.

**Results:** Only data relevant to the objectives of the study and main conclusions emerging from the study should be included. The data should be arranged in a unified and coherent sequence for clarity and readability. The same data should not

be presented in both tables and figures, and such data as can be easily and briefly stated in the text should not be depicted diagrammatically. Only such tables and figures as are necessary should be given. Tests of statistical significance should be identified and references used should be cited. Statements about the statistical significance of the results must be borne out by the level of significance, preferably provided in the tables and legends. The use of the word "significant" should be restricted to "statistically significant".

**Discussion:** The discussion should provide an interpretation of the results of the study, without repeating information already presented under Results. It should relate the new findings to the known and include logical deductions. Where necessary, the Results and Discussion can be combined.

**Illustrations:** The number of illustrations should be kept to the minimum and numbered consecutively in Arabic numerals. Simple linear plots or linear double reciprocal plots that can be easily described in the text should be avoided. Extension of graphs beyond the last experimental point is permissible only while extrapolating data. The drawings are usually reduced to the page width or column size, and care should be taken that the size of letters, numerals, dots and symbols is relatively uniform and sufficiently large to permit this reduction. Photographs should be the same size as they will appear in the journal and should be selected to fit neatly into one column (80 mm) or two columns (168 mm). Photographs should be labelled and numbered as for line drawings. For microscopical preparations, scale bars with appropriate units must be provided; statements of magnification are not acceptable.

**Tables:** Each table should have an explanatory title and should be numbered in Arabic numerals. Units (metric) of measurement should be abbreviated and placed below the headings. Negative results should be indicated as Nil (0) and absence of a datum by a dash.

**Acknowledgements:** Acknowledgements should be brief and relevant.

**References:** Responsibility for the accuracy of references rests with the author(s). References must be checked against the text to ensure (a) that the spelling of authors' names and the dates given are consistent and (b) that all authors quoted in the text (in date order if more than one) are given in the reference list and vice versa. The full title of the paper must be given together with the first and last pages. Abstracts of papers presented at scientific meetings may be cited. References to literature should be alphabetically arranged under author's name, with the abridged titles of journals or periodicals in italics and titles of books or papers in Roman type.

**Miscellaneous Notes:** The section accommodates incidental observations on flora and fauna of the Asian region, and need not follow strictly the above section headings. No abstract is required, but key words may be included and references must be cited as in the rest of the Journal.

The Editors reserve the right, other things being equal, to publish a member's contribution before that of a nonmember and also to publish invited papers on priority. Authors may suggest up to four referees for their paper; however, the Editor reserves the right to choose referees other than those suggested.



## CONTENTS

EDITORIAL .....	125
NEW RECORDS OF OPISTHOBRANCH FAUNA (HETEROBRANCHIA: MOLLUSCA) FROM ANDAMAN & NICOBAR ISLANDS, INDIA Deepak Apte, Sumer Verma and Digant Desai .....	127
RARE AND INTERESTING BUTTERFLY (LEPIDOPTERA) RECORDS FROM ARUNACHAL PRADESH, INDIA Arun P. Singh .....	138
MISCELLANEOUS NOTES .....	165